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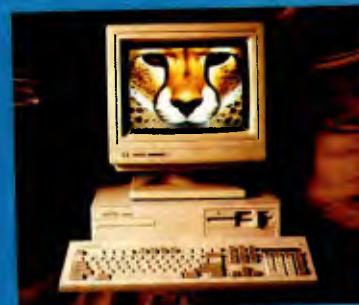
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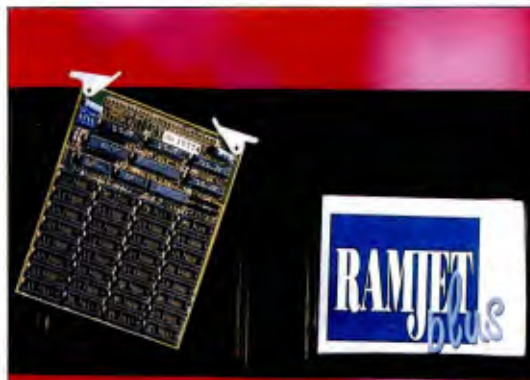
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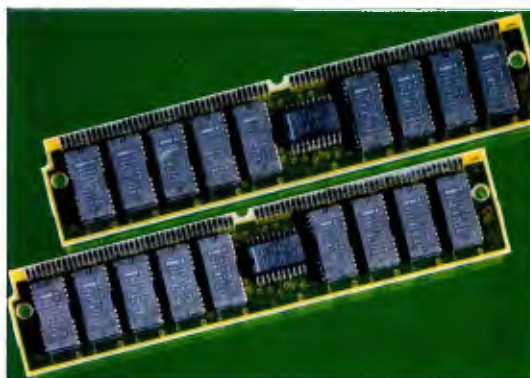
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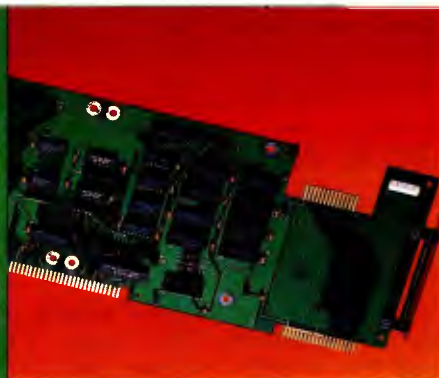
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July 1990

Cover Photography: Robert Blackburn

REGULARS

7 NEWSPRINT

Technological advances revealed this month include trillion byte storage systems, gigabyte data transfer rates and a graphics/sound chip with a bandwidth of 266 million bytes. Plus, on a more mundane level, multi-tasking for 8088-based PCs.

33 FIRST LOOKS

This month's releases include:

- **Designer 3.0** With Windows 3.0, Micrografx's drawing program improves
- **HyperCard 2.0** A faster, more capable version of Apple's innovative organiser
- **Time Line 4.0** Pre-eminent project manager adds presentation graphics and mouse support
- **Control Room** Do-everything utility makes configuring and surveying systems a snap
- **COBOL/2, version 2.4** Allows COBOL programmers to write applications for OS/2 Presentation Manager, DOS and mainframes systems
- **ToolBook** Puts Windows applications development into the hands of power users

22 PRODUCT UPDATE

APC's summary of major product upgrades.

47 TWO BITS WORTH

Windows 3.0 has certainly made people talk. Two of our columnists express their views. Other topics discussed this month include Unix's continuing problems, ToolBook and how the fundamentals of programming haven't really changed.

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Where we poke fun at everyone (except ourselves).

Managing Editor: Sean Howard; **Assistant Editor:** Cathie Kennedy; **Consultant Editors:** Steve Withers and Ian Davies; **Editorial Assistant:** Sidonie Bouchet; **Proofreader:** Sharon Weinman; **Graphic Artist:** Joanne Kummrow; **Advertising:** Gerard Kohne, Iain Aitken and Richard Dickinson (02) 387 3888; **Vic, SA, WA and Tas Sales Manager:** Julie Dominguez, **Marketplace:** Vicki Todd (03) 531 8411; **Production:** Graphic Heart Pty Ltd. **Subscription Enquiries:** Debbie Middleton (02) 387 3888; **Standard subscription rates:** Australia \$52.00 per annum, overseas A\$110 (surface) A\$245 (airmail). **Newsstand Sales:** Network Distribution Co. 54 Park Street, Sydney 2000.
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FEATURES AND REVIEWS

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Ian Davies puts Sharp's tiny 2kg laptop through its paces. Is this the laptop you've been waiting for?

78 THE SUN SLC

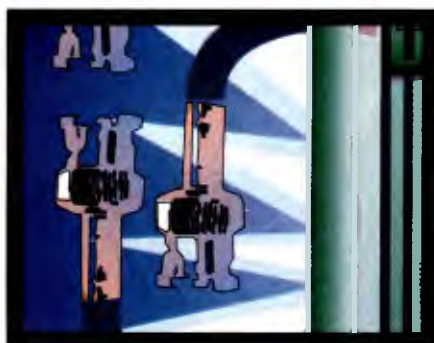
Sun has brought the cost of its workstations below that of high-end PCs. Given the quality of applications now available on its systems — including WordPerfect and Lotus 1-2-3 — you may be asked to consider these alternatives to traditional DOS-based PCs.

92 PLAYING THE DOS SHELL GAME

Whether you're a PC novice or a power user, one of these eight programs has a set of file and disk management features to help you compute better and faster. Bruce Brown explains.

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Kester Cranswick takes a look at a cross-section of mice and trackballs, explaining why, with the release of Windows, life without them is pretty dull.



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When the 10BASE-T standard becomes final in September, it will pave the way for 10Mbps Ethernet over unshielded twisted-pair wiring using components from multiple vendors. Here's what you need to know.

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Let your PC read your E-mail to you, or listen as a voice explains the spreadsheet on your screen. The potential of voice E-mail systems is within reach today. APC evaluates Artisoft's LANtastic and the Wang Freestyle System.

193 TRIM THE BRANCHES OF YOUR DIRECTORY TREES

Michael Mefford's PRUNE allows you to clean up that mess you have always wanted to tidy. With his utility, directory management becomes a cinch.

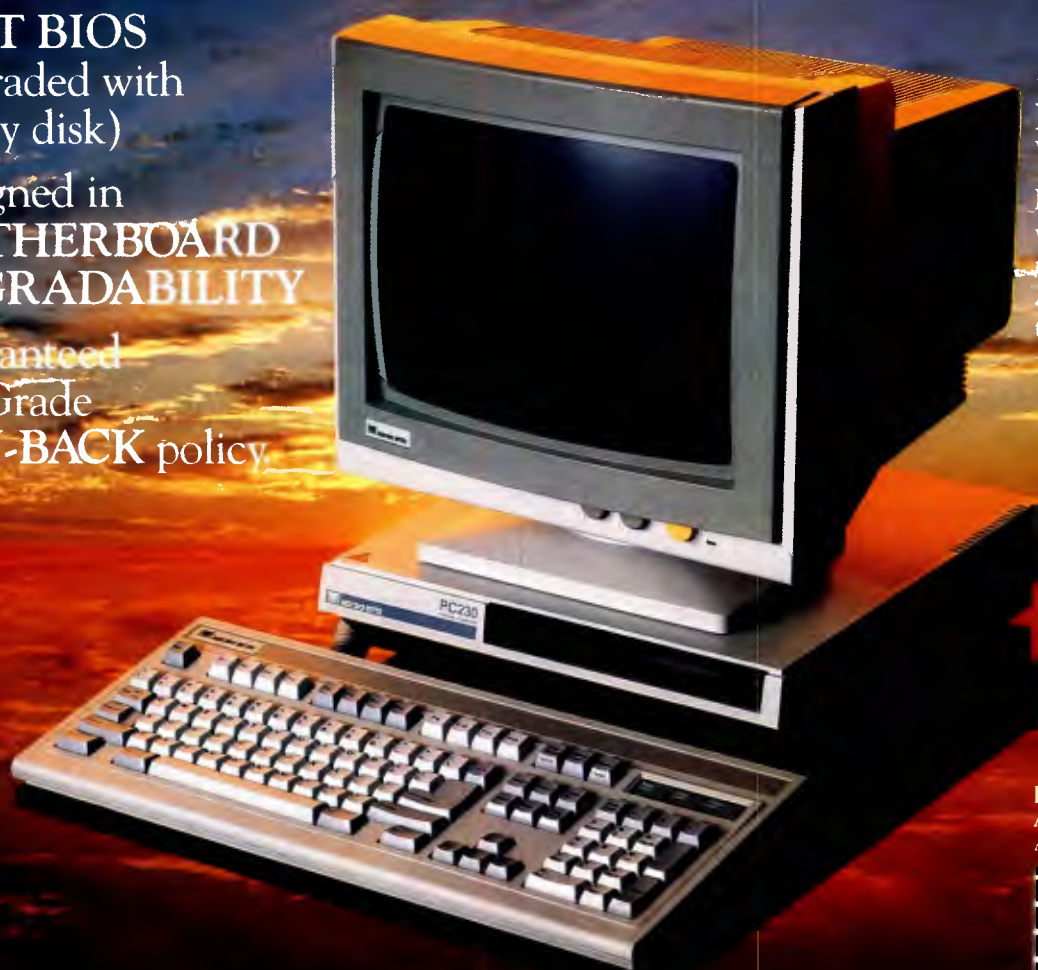


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Windows continues to attract support, this time from desktop publishing supremo, Xerox, and market-leading word processor, WordPerfect; there's a real prospect of \$70 graphics and sound chips with bandwidths of 266 million bytes to give multi-media a real push; and Apple's System 7.0 is delayed again (makes it seem more like a Lotus effort). This and lots more in APC's monthly news round-up . . .

Windows, OS/2 now head-on

Remember when OS/2 was going to kick DOS right off the desktop — sometime during the early 1990s? Well, that tune has been changing lately, particularly with the interest given to Windows 3.0, and even Microsoft isn't singing it anymore.

In a recent interview, Microsoft's Steve Ballmer, head of systems software, said that the company is "trying to kick off a new perception of OS/2." He christened OS/2 with a new nickname: Windows Plus. That designation is a far cry from what we used to hear, which was, in effect, that Windows was 'OS/2 Minus'.

The new OS/2 and the new Windows will have the same user interface, Ballmer said, but OS/2 will have better security features, better memory protection and the ability to function as a LAN peer rather than just a client.

What Ballmer and other Microsoft officials have been suggesting is that Microsoft (and, presumably, IBM) is increasingly viewing Windows as the primary graphical environment for individual PC clients, while OS/2, running at the server level, will provide a more robust superset of Windows' capabilities for

large networked applications. Applications software houses are adopting this approach, too, with even hold-out Lotus Development committing to a Windows-compatible 1-2-3.

This change can be traced to two new capabilities for OS/2 that were officially announced recently. Microsoft said that at some point in the future, perhaps late this year, OS/2 will be able to run Windows programs directly. In other words, you won't have to run Windows applications under OS/2's DOS compatibility box. With this capability, any Windows application would be able to run directly under OS/2 just like a normal OS/2 program. In practice, OS/2's new capabilities would mean that Windows applications could swap data with other Windows or Presentation Manager (PM) applications through OS/2 Dynamic Data Exchange channels or the clipboard, thus eliminating migration penalties between the operating systems for end users and facilitating networked applications involving programs written for both environments.

Microsoft says that this capability will be available in



Windows 3.0: receiving an enthusiastic response from users

a future edition of OS/2 version 2. Ballmer says that it could appear in the version that will show up by the end of this year, but the company does not want to commit to that date.

The second and related capability is a new Software Migration Kit that could greatly simplify the task of porting Windows applications to OS/2 for developers. Using a concept similar to Micrografx's Mirrors — in fact, parts of the technology, though not the code itself, were licensed from Micrografx — this kit provides a set of libraries that developers can link into Windows applications to map their Windows calls into PM calls. Microsoft hopes that using this kit will slow performance down by no more than 10 per cent.

Some industry observers have complained that Microsoft has failed to differentiate Windows from OS/2 in a man-

ner understandable to users. Ballmer's comments changed that situation in an unexpected way: for the first time, instead of hearing OS/2 touted as an end-user operating system (which, of course, it can still be) or that the user's CPU and memory configuration should determine which operating system to install, Microsoft appears to be easing into a client/server model at the operating-system level. Software companies that develop DOS applications are adopting that approach, too.

This positioning will help OS/2-based LAN Manager and SQL Server, but the biggest beneficiary will be the corporate computer manager with an installed base of hundreds or thousands of 286-based machines: now, the pressure to convert from DOS to OS/2 on every desktop has lessened considerably.

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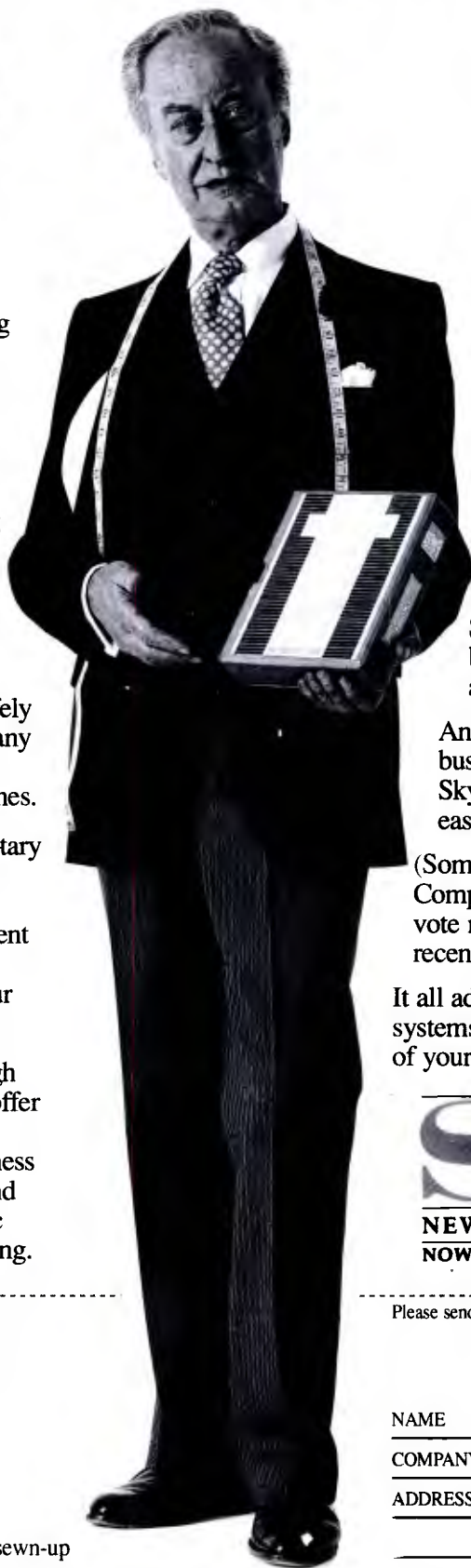
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Media processor built to handle colour graphics, stereo sound

If industry evangelists are right that images and sound will be a big part of computing, systems are going to need more power than what they have in their general-purpose CPUs. Motorola thinks that it has the answer with its new 96002 FPU, a 32-bit chip designed to handle the furious calculations and frenzied data shuttling involved in generating colourful graphics and stereo sound. The new processor "is not so much a CPU as a chip to deal with real-time, continuous I/O," said Garth Hillman, applications manager for Motorola's digital signal processor operations.

The 96002 is a successor to Motorola's 24-bit 56001 DSP (used in the NeXT Computer), but the designers have built in an FPU (conforming to the IEEE-754 standard) to deal with the calculations required by three-dimensional graphics and algorithms for realistic imaging. At the core of the 750,000-transistor chip are four devices: an ALU; a program-control unit; a dual-channel DMA controller, which can work on two data transfer tasks at the same time; and an address-generation unit.

These execution units and the 96002's six on-chip memories (three ROMs, three RAMs) are connected by eight 32-bit buses (five data, three address), with a bandwidth of 266 million bytes per second, Motorola says. With all these execution units, memories and high-speed buses, Hillman said, the chip can process 10 operations in one instruction cycle.

Motorola has designed the 96002 to work as an "attached processor," Hillman said. It's meant to handle all the chores related to media processing instead of the host CPU (eg, a 680x0 or 80x86). The chip has two



Partnership program sires new Bull PCs

Bull HN Information System's investment in an Australian manufacturing facility has borne early offspring — a range of locally designed and built PCs called the Bull Work Centre (BWC).

The five PCs, ranging from a low-end XT to a 33MHz 80386 machine, are part of Bull's commitment to local manufacturing under the federal government's Partnerships for Development Program (PDP). The cost of the BWC family's development is effectively an offset against the value of Bull's government business.

While some industry observers will no doubt criticise Bull for the comparatively low level of technology involved in its local PC design and assembly, the BWC series has a sound marketing rationale.

"With the BWC range, we are able to offer an alternative to customers who are looking for quality products with the backing of a multinational computer company, but who also find the idea of buying a locally designed and manufactured product attractive," said marketing manager, Melinda Robertson.

All BWC systems are available immediately with various combinations of hard disks, 1.2M or 1.44M floppy drives and video controllers already installed.

The low-end machine, the BWC-88, is a small footprint desktop machine with a 10MHz 8088 Intel processor. It features 640K of RAM, optional 20M or 40M hard disks and a 360K floppy drive with prices starting around \$2000.

The BWC-286 is a 12MHz Intel 80286-based system also housed in a small footprint cabinet. Hard disks are available up to 80M with 1M or 2M of RAM on-board, expandable to 8M. A 20M system with VGA colour monitor and controller costs around \$3500.

Bull's BWC-386SX offers 40M, 80M or 100M hard disk options on a 16MHz system which includes built-in disk caching and a 16-bit 'fast slot' for a Bull extended memory board. A VGA configuration costs around \$4400.

Also housed in a small footprint cabinet is the BWC-386/25, supporting up to 4M of RAM on-board and another 12M on a 32-bit fast slot board. The system includes a 32K RAM cache and optional 40M, 100M or 200M hard disks. VGA systems list from around \$6000.

Most horsepower is provided by the high-end BWC-386/33 Tower, accommodating up to eight storage devices. It is shipped with 1M of RAM standard and similar memory options to the 386/25. The system can support up to three 200M SCSI hard disk drives and retails from \$9200 for a basic colour VGA configuration.

Chris Bowes

32-bit ports on opposing sides, by which the processor can directly send and receive commands to and from other processors. Using these two ports, a designer could string multiple 96002s in linear arrays or in symmetrical blocks, Hillman explained.

Because the chip can appear to generate images and sound simultaneously, Motorola says, it will be perfect for multimedia computing machines. However, the 96002 could also find a place in graphics engines, scientific imaging systems, colour laser printers and communications devices.

Motorola says that computers and boards using the new 'Media Engine' will arrive later this year. The first company to introduce a 96002 product is Ariel which offers an add-in board called the MM-96 for AT compatibles.

Motorola has started offering samples of the 96002. The first version has a clock speed of 33MHz; a 40MHz model is in the works. The price for a 33MHz model is around \$1000. Motorola says that the price will tumble; Collins pointed out that the 56000 DSP came out in 1987 at \$700 and now sells for \$70.

Until now, building a system that can manipulate realistic graphics and CD-quality audio required multiple chips dedicated to those different media. Motorola has developed one device that can handle the billions of computations involved in audiovisual operations. The 96002's dual-bus approach represents "where DSP is going to head," said Ariel president Anthony Agnello. "People who write algorithms are insatiable for power."

D Barker

Another platform for WordPerfect

WordPerfect has started beta-testing its word processor for OS/2 Presentation Manager and expects it on

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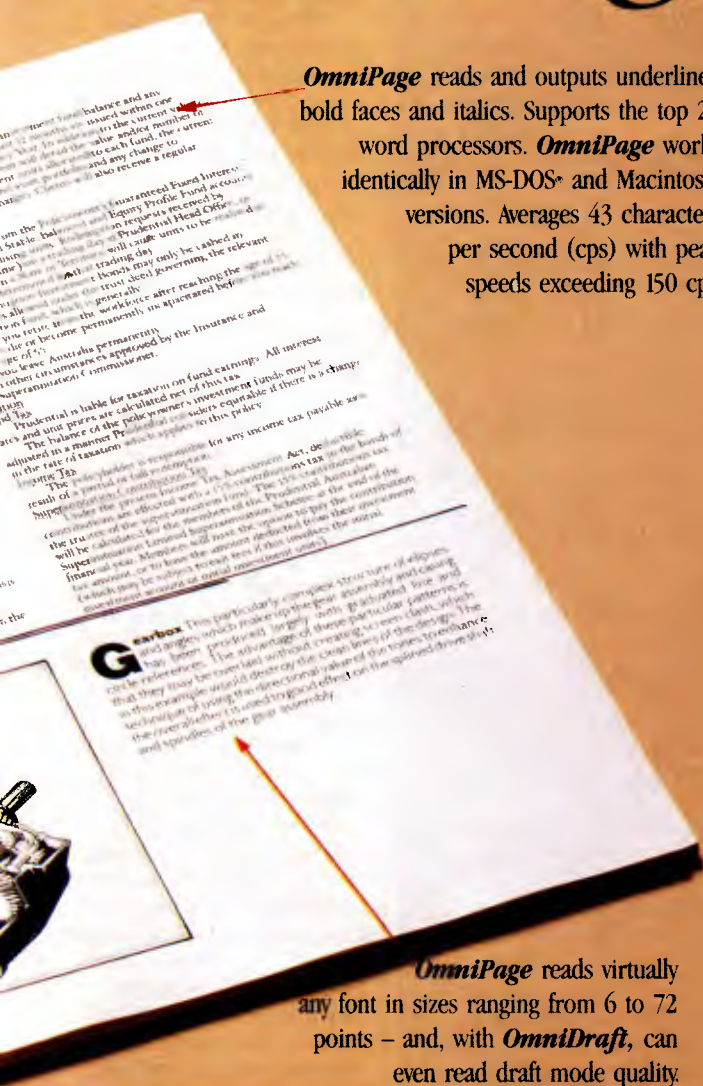
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the shelves by the end of the year. The company will provide its OS/2 drivers for the hundreds of printers now supported by DOS editions of WordPerfect. The company says that it's committed to a Windows version but doesn't think it will be ready until 1991.

Mac developers finally see System 7.0

Apple Computer promised to deliver System 7.0, its major revision of the Mac OS, about the middle of this year. But the first quarter of 1991 is a more accurate projection. Apple finally distributed an alpha version with the System 7.0 development kit, on CD-ROM, to independent developers in May. Apparently realising that software designers can make or break the new Mac OS, Apple officials used the Worldwide Developers Conference to convince them that System 7.0 will be worth their investment.

In addition to a totally revamped Finder shell (which, among other things, will actually find a file based on user-supplied search criteria), the new system software will support an interapplication communication (IAC) protocol. IAC will allow implementation of a publish/subscribe mechanism that can, for example, update information within an existing document when information changes on another linked document. The ability to use and recognise IAC events will be the hallmark of System 7.0 applications, but will certainly require developers to rewrite their existing applications.

Some of the anticipated features of System 7.0 are not yet being released to developers; one of these is the AppleScript language, intended to allow users to customise their environment at a fairly high level. And a few features promised at last year's developers conference will not appear in System 7.0, including asynchronous SCSI protocols (perhaps



Non-standard notebooks from Psion

If British-based manufacturer Psion is to be believed, the laptop computer of the twenty-first century, the 'Mobile Computer', is available today, and at a price anyone can afford.

But the unfortunate reality is that the Psion notebook's world-beating functionality — small size, light weight, 60 hour battery life and multi-tasking graphical user interface — comes in a non-IBM-standard package.

And while Psion offers a DOS standard machine, the MC 600, along with its proprietary offerings, the MC 200 and MC 400, even this is sufficiently non-standard to jolt the average user.

To achieve these objectives, two of Psion's machines, the MC 200 and MC 400, diverge markedly from the popular MS-DOS standard, offering a proprietary 'Graphic Interface', which features 'Touch-Pad' operation — replacing the conventional mouse — and multi-tasking capability.

The third machine, the MC 600, is a conventional DOS computer, but in common with all Psion's mobile computers employs 'Flash Memory', in preference to a built-in hard or floppy disk.

It is this solid state disk (SSD) technology, co-developed with Intel and Microsoft, that enables the mobile computers to achieve up to 60 hours battery operation.

All Psion notebook PCs are 80C86-based, running at 7.7MHz and incorporating four memory ports for erasable flash cards which vary in capacity up to 512k of RAM or 1M of ROM.

The cost of these cards — around \$350 for the higher capacity units — and the lack of packaged software in the flash format could inhibit market penetration of the DOS-compatible MC 600. These factors are less likely to faze users of the proprietary models, however, which include a built-in suite of graphical applications.

All three machines share the same A4 by 5cm notebook case and 1.95kg weight. Battery life varies, from 25 hours for the MC 600 to 60 hours for the MC 200 and MC 400.

Peripherals for the machines, including modems and faxes (announced but not yet available), will conform to an innovative and convenient clip-on standard. Particularly interesting is a voice processing module that will allow recording and playback. It is intended to be integrated with applications such as a diary and databases.

The MC series will be distributed in Australia by Queensland-based Set Technologies. The bottom of the range MC 200 will retail for \$1700, the MC 400 for \$2600 and the MC 600 for \$4600. The MC 400 and MC 600 include a superior black and white LCD display.

Chris Bowes

Apple is waiting for the final implementation of SCSI-2) and the new Print Architecture. Apple personnel said that there wasn't time to implement these functions. "We had to decide what was of the most importance," one said.

Although Apple states that System 7.0 will run on any Mac with 2M of RAM and a hard disk drive, quick tests of the alpha version showed it to be unacceptably slow on any machine other than a Mac II. Apple could fix this speed problem before issuing the final software, however.

The question for developers, then, becomes whether or not it will be worth their time and money to revise their programs. Apple is trying hard to get them motivated, if not intimidated; one company official even said that "if you don't go the System 7.0 route, you'll be out of the Mac software business in a few years." Developers at the conference were generally positive, if somewhat confused.

Regardless of how many Mac software companies migrate to System 7.0, compatible programs will be delayed, because developers can't really get started until they have a beta version of the operating system to work with. Delays could be further extended because System 7.0 is very complex, involving memory management of multiple tasks and interprocess communications (IPC). One veteran Mac programmer, Yung Harvill, said he fears that users will be reluctant to upgrade to System 7.0 until their favourite applications run smoothly under it.

Many existing Macintosh software products will not be compatible with System 7.0, said Harvill, who developed Paracomp's Swivel 3-D program and also worked on VPL Research's DataGlove. "A lot of older products fiddled with the high memory bits," he said, "and those won't run

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on System 7.0." Macintosh software vendors will have to establish "more formal relationships" with each other, Harvill said, since interprocess communications will require integration of programs from different vendors.

Nevertheless, Harvill said he looks forward to System 7.0. "The virtual memory and IPC features will really help us," he said.

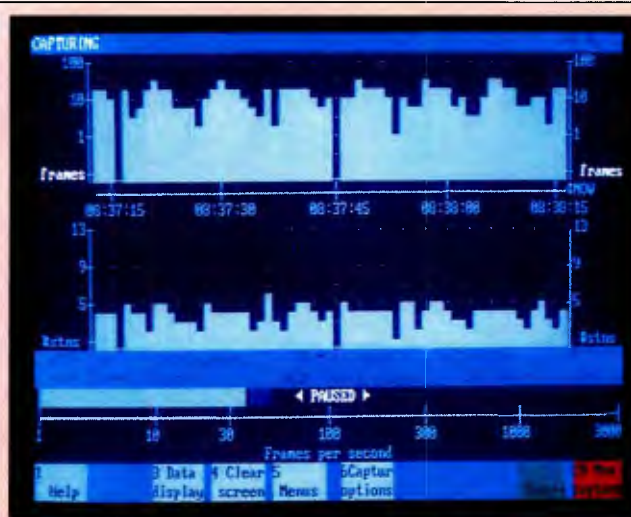
N Baran

Good things come from small packages

Smallness has been such a theme in Microsoft head-honcho Bill Gates's public comments lately that you'd never know he heads a software company that's anything but small. Gates told some users group representatives during a late-night session that he was unimpressed by a competitor's boast in an advertisement that it has 35 programmers working on a product. "It takes a small team to do it right," Gates said. "When we started Excel, we had five people working on it, including myself. We have seven people working on it today, and at the maximum we had 15 people working on the program. There's too much that needs to work together to have so many people spread out on a program."

Standard would enable expert systems to exchange knowledge

Major high-technology vendors and users have banded together to formulate an open software standard for expert systems. The standard, which they expect will be used in new expert systems later this year, is designed to facilitate interoperability among knowledge-based programs that run on different hardware and operating-system platforms.



LAN analyser supports 16Mbps Token Ring

Network General's network analyser, the Sniffer, has been a sleeper in the Australian marketplace with former distributor, Information Network Systems selling only 30 of the \$30,000 systems in the last two years.

This is set to change with one of the big boys of the emerging PC systems market, Bull HN Information Systems, taking on the product. The move coincides with the release of a Sniffer network analyser built around an IBM PS/2 with an IBM 16Mbps per second (bps) Token Ring adaptor.

The product should prove strategic for Bull's new Integrated Network Solutions group. With it, an operator can locate and identify a wide range of problems afflicting LANs — from identifying non-operational LAN adaptor cards, file servers and workstations to locating baffling software bugs.

The Sniffer is packaged into a portable PC with configurations for network environments including Ethernet, Token Ring, StarLan, AppleTalk and Arcnet.

Network General's recent release enables the Sniffer to handle both 4M and 16Mbps Token Ring networks, and introduces a new model based on the PS/2 Model P70 portable. By virtue of its IBM-manufactured Token Ring card, the new PS/2-based Series 700 Sniffer is designed to be more reliable than Token Ring analysers which use third-party adaptors.

Existing Series 500 Sniffers are based on the Compaq Portable 386. This platform will also support the new Token Ring analysis features which include the ability to diagnose networks disabled by hardware failures. They can attach to such networks and bypass the 'beaconing' signal that restricts access to the failed network.

The Sniffer also supports a variety of network protocols including X Windows, OS/2 LAN Manager, ISO, TCP/IP, DECnet and AppleTalk. As well as debugging faulty networks, the Sniffer can detect potential trouble spots in LANs before they impair performance. Monitoring capabilities allow network managers to set audible and visual network-wide alarms or individual alarms for up to 1024 stations.

Officials of new distributor, Bull, are yet to determine exact pricing of the new Sniffer range, but expect a typical configuration to be priced from \$30,000. Bull will be able to supply Sniffers some time in the third quarter.

Chris Bowes

The Initiative for Managing Knowledge Assets (IMKA) was founded by DEC and Texas Instruments, among others. IMKA has just begun to develop the code that it says will be used to write a new generation of expert-system software.

Those new expert systems are expected to run on many major operating systems, including Unix, OS/2 and VAX/VMS, and on all types of machines, from mainframes to personal computers, although the programs will not run on DOS-based machines.

The new software will allow expert systems residing in many facilities and on different computers to access and analyse data residing anywhere else in the organisation, said David Fawcett, manager of expert systems at Ford. For example, Fawcett said, a design engineer using a CAD/CAM workstation equipped with an expert system based on the new standard will be able to import 'knowledge' from a different type of computer located at a remote production facility, allowing the designer to access information on manufacturing specifications or even financial data that might affect the design.

The code for the new standard is being built using C and C++, and will employ an X Window System-based user interface on all platforms. The expert systems based on the standard will be compatible with Structured Query Language-based database systems, the developers say.

Co-operation between member companies is limited to the development of the new software code. Each partner will be allowed to use the code to produce and market its own knowledge-based expert systems. IMKA is looking for new recruits from around the world to contribute funding or technical expertise.

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Trillion-byte data storage . . .

ICI ImageData, a British company that makes the substrate used in floppy disks, is working on a new type of optical media. ICI's 4mm Laser Tape, based on a technology developed jointly by Sony and Hitachi, uses a technique called holographic tag recording to put one trillion bytes of data in a single package just slightly bigger than a digital audio tape cartridge. A company official said that the compatible drives will be able to access any piece of data in an average of 28 seconds.

. . . Transferred at lightning speed

Advanced Micro Devices and Vitesse Semiconductor are working together on high-speed circuits for data communications. The gallium-arsenide chips will be part of "gigabit-speed connections between computers," an AMD official said. The initial joint product will be chips for electronic interfaces to optical systems, the companies said.

Sharp plans better-looking colour LCD this year

Although Sharp and NEC are now selling portable computers with flat-panel colour displays, both companies admit that the screens leave something to be desired. The colour is washed out and the viewing angle is restricted.

But that picture could change soon. Sharp plans to have a colour 10in LCD panel available to OEMs by the end of September. The colour screen could appear in portables by early next year. The new Sharp display uses the same active-matrix technology as the Macintosh Portable but adds 512 colours and VGA resolutions.

Active-matrix colour LCDs are now used in tiny TVs and have been heralded as the display technology of



Colour printer for mixed computing sites

While colour printing is not yet an affordable technology for most offices, Tektronix Australia's latest release, the colour PostScript-compatible Phaser PX, allows well-heeled users to get the most from their investment.

The 300 dots per inch (dpi) Phaser PX includes serial, parallel and AppleTalk ports as standard and is able to automatically switch between ports, allowing the printer to be shared across a variety of environments.

This 'multi-tasking' connectivity capability is claimed to be a technological edge for the \$15,594 Phaser PX over competitive products, none of which performs automatic switching. This extra functionality comes at additional cost, however, as it requires a memory upgrade. A 4M RAM expansion kit is available for \$3000.

In addition to PostScript, the Phaser PX supports the Hewlett-Packard Graphics Language (HP-GL). HP-GL emulation is compatible with HP7475 plotter drivers, including extensions for 256 colours, user selectable timeouts and scaling.

The Phaser PX also has the ability to dynamically switch between PostScript and HP-GL emulation. This means that one input port can be set to accept HP-GL files while the others are set to receive PostScript files.

For example, when equipped with the optional 4M memory upgrade, the Phaser PX can simultaneously receive HP-GL input from a workstation or minicomputer through its serial port, PostScript input via the parallel port from an IBM PC and AppleTalk input from a Macintosh.

The new printer includes an integrated PostScript language compatible controller based on a Motorola 68020 chip running at 16MHz. Its standard configuration includes 6M of memory. In addition to multi-tasking, the 4M memory upgrade gives faster throughput and extra storage for downloadable fonts.

Resident fonts include the same 35 trademarked typefaces that are standard with the Apple LaserWriter. Download support is provided for Adobe Type 1 and Type 3 formats. This includes fonts supplied by Bitstream, Agfa Compugraphic, Linotype, The Font Company and others.

The Phaser PX prints on coated paper as well as over-head transparency material in both standard letter and legal sizes. The printer also includes SCSI hardware support for an optional hard disk used for font caching. This will be supported by a future release of the system's software.

Any existing Tektronix colour thermal wax transfer printer can be upgraded to the PX's capabilities for \$7794.
Chris Bowes

the future. But poor manufacturing yields have made panels larger than about 6in across unreliable and prohibitively expensive. The difficulties of making even a monochrome active-matrix panel accounted for much of the delay in the Macintosh Portable.

The new thin-film transistor (TFT) Sharp screen represents two innovations. First, each pixel is backed up with two transistors, so if one fails, another is there to take its place. Second, the company has a new manufacturing line that uses laser repair equipment; defective transistors can be fixed or removed before the display leaves the plant.

The Sharp TFT screen has a total of 921,600 pixels, or three for every point of a 640 by 480-pixel VGA array (one each for red, green and blue). The quality difference between the TFT screen and the passive-matrix display in the Sharp Multi-Colour 386 is striking: the TFT's colours are bright, rich and solid, and the horizontal viewing angle is a wide 120 degrees.

The panel uses a lot of juice — about 12 watts, including hot-cathode back-lighting — so for the time being, it's practical only for AC-powered machines. It also weighs only one kilogram or about half as much as some entire notebook computers.

Sharp estimates that its colour LCD panels will cost five to 10 times as much as a conventional monochrome LCD. This could make for an expensive computer, but Sharp, which plans to use most of the displays itself, thinks that it can produce a model for about the same price as the Multi-Colour 386.

A Reinhardt

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ColourPic Amiga – Similar specification to SuperPic Amiga, without genlock but includes UHF TV output.

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NEWSPRINT



GeoDOS promises 8088-based PC users a multi-tasking graphical user interface

that's a wave of the future, according to Microsoft chairman Bill Gates. Gates recently told an Apple users conference that he bases his forecast on what he sees as a move away from large, multi-featured application programs, like Word and Excel, to small, special-purpose programs that can work together.

"Because things are fairly self-contained today, with simply cutting and pasting, you can have only these large applications. You can't have these nifty little tools that you pull in to manipulate a little bit of data and then move that data onto another application," Gates said. "With an architecture of small to medium-size applications to attach to larger applications, we allow small software companies to provide specialised packages that will appeal to special audiences that the larger companies like our's cannot address."

The technology that will spur these new programs and small companies is the Dynamic Data Exchange channel in Windows and OS/2, which allows applications to easily exchange information, Gates said.

D Reed

Operating system updates

IBM is intent on fulfilling its promise to reduce the memory requirements of OS/2. It is currently shipping

beta versions of a slimmed down OS/2 1.2 which uses one third less RAM than the existing version and runs twenty five per cent faster.

To prove its success, IBM last month demonstrated a PS/2 55SX running the beta version. Multi-tasking two Presentation Manager applications and one DOS application required only two megabytes of RAM, roughly equivalent, Microsoft officials conceded, to what Windows 3.0 would require to do a similar job.

The problem remains, though, that OS/2 still lacks applications; Windows, on the other hand, can run multiple DOS applications now.

At the other end of the spectrum — 8088-based PCs — a surprise entry into the operating system arena emerged last month.

GeoDOS is a multi-tasking DOS-compatible operating system designed for PCs equipped with only 8088 processors and 512K of RAM. Developed by GeoWorks (formerly Berkeley SoftWorks), GeoDOS is written in assembly language and occupies 200K of RAM. While it will run a single unmodified character-based DOS application full screen, GeoDOS will allow developers to create applications which will take advantage of the system's object-oriented interface and multi-threading and pre-emptive multi-tasking capabilities.

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Planned for release in November, GeoDOS will come with an integrated set of applications including a word processor, a graphics and a communications packages.

Windows on a chip

Now that the legendary new Windows has arrived, where is it going next? Some people at Microsoft hope to squeeze it into ROM and have computer makers pop the chips onto their motherboards. The company has put DOS into ROM (and Digital Research has done the same with DR DOS). There's 'no magic' involved in getting the graphical environment into ROM, according to Rich Abel, Microsoft's group project manager for Windows. But considering the amount of RAM that Windows 3.0 requires, Windows-on-ROM may be a chip-consuming task.

Bludner

The inaugural Product Update column in last month's issue got a couple of prices mixed-up: the Australian-designed cashbook management program from Quercus sells for \$395, not the \$10,000 stated; and Timeplex's ISDN Concentrator sells for \$10,000, not the unbelievable \$395 we published. Apologies to readers and both companies.

Bad news

From the next issue, APC's cover price will increase \$1 to \$5.95. While it has been 18 months since the last increase, we can't get around the fact that any price increase is bad news. We will, however, strive to improve APC each issue to ensure it remains the best value computer magazine in Australia.

END



New Ventura version to cover all bases

Ventura Publisher is the latest popular package to adopt the multi-platform marketing strategy adopted by many major vendors, in this case Ventura Software, a Xerox company.

The new releases, expected to be available by the end of the third quarter, will include the Ventura Publisher Gold Series, which comprises versions for Windows 3.0 and OS/2 Presentation Manager (PM) as well as an upgrade to the existing DOS GEM version. Of equal significance will be a version of the page-layout program for the Macintosh.

All versions of the program are expected to have file compatibility with each other and will include all of the publishing features of Ventura's Professional Extension module, which is tailored toward technical and engineering publishing.

The Macintosh version, expected in August, will take advantage of the Mac's memory-management facilities to avoid using expanded-memory products in order to squeeze Ventura's nearly 2M of code into RAM.

Its entry into the Mac market could pose a threat to market leader PageMaker from Aldus, industry observers said.

An early Windows 3.0 version of Ventura Publisher (pictured here) is slated to be released at the end of this month (July) and available in Australia early August. This edition will also include the capabilities of the forthcoming GEM release.

Ventura Software is planning a further release that would fully harness the capabilities of Windows 3.0, including support for Windows' dynamic data exchange (DDE) protocol.

After more than a year and a half without a major upgrade, a new DOS GEM version of Ventura Publisher will be released later this month. Ventura Publisher, DOS (GEM) Edition will feature several new import/export filters and improved footnote capabilities.

Finally, in late September, Ventura Publisher will release an OS/2 PM version.

Graham Hobbs, Xerox Australia marketing manager, said the firm is currently testing beta versions of all but the Macintosh edition locally. At this stage, he says, pricing will not differ greatly from the current RRP of \$1535.

Ventura Publisher was acquired in March by Xerox Desktop Software (XDS), the marketer of the product, from Ventura Software. XDS recently changed its name to Ventura Software, a Xerox company.
Chris Bowes

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New versions, have we got new versions for you this month . . . Check out the latest upgrades of anything from compilers to desktop publishing.

Forceful compiler

Sophco has enhanced its dBASE-language TSR-creating compiler. According to company officials, added NetBIOS support provides familiar Clipper and FoxBASE-like networking, as well as advanced dBASE, FoxBASE and Clipper-aware record locking.

Force 2.0's network communications system informs users when a locked record becomes available. It also creates a processing environment that permits distribution of the workload across several network nodes. Other improvements include the ability to have up to 255 files open simultaneously, interrupt processing via 'On Key' support, private variables, a save/restore screen to and from private variables, and C programming language library compatibility.

- ♦ **Distributor:** Talsoft, (02) 317 4404
- ♦ **Price:** \$1075; upgrades for registered users, free

Quick typing

Version 6 of the keyboard training course TypeQuick has been revealed. Realising the importance of motivation,



TypeQuick Australia has made it a priority to add more detailed personal messages with enhanced praise. The speed and accuracy section of the course is more varied and now includes the 100 most common words, names and addresses, famous quotes and one hand exercises. Revision exercises, based on error-prone or slowly-accessed keys, are offered between parts of lessons and different lesson lengths may be selected.

- ♦ **Distributor:** Typequick Australia, (02) 498 7433
- ♦ **Price:** \$99

Lotus position 3.1

Lotus Development has announced that it will now incorporate PC Publishing's Impress technology into Lotus 1-2-3 to augment the program's graphical capabilities. New features will include: interactive WYSIWYG display and printing, mouse support, advanced worksheet formatting, text editing, graphic drawing tools, .CGM file support, page preview and publishing quality output.

It will also support the .ALL file format of Release 2.2 with Allways, the .FMT format used by Impress, and Bitstream display and printer fonts. Spreadsheet operations will work within the WYSIWYG environment, including adding, modifying, and deleting information and executing worksheet commands. A new virtual memory management system will let users dedicate an area of their hard disk for storage to improve 1-2-3's performance on machines with only 1M of RAM.

Enhanced add-in support will facilitate the use of Release 2 add-ins. Available in the third quarter, 3.1 will launch from an icon in Microsoft Windows 3.0, and users will be able to copy information from the Windows clipboard. Furthermore, Lotus Development has announced that Release 3.1 is the first step toward providing a full graphical implementation of 1-2-3 under Windows.

- ♦ **Distributor:** Lotus Development, (02) 287 1900
- ♦ **Price:** Standard edition, \$995; free upgrade if 3.0 purchased between May 7 and Oct 30; upgrade from 3.0, \$80; upgrade from other 1-2-3, \$250

More ISYS, less RAM

Currently in the final stages of beta testing, version 2.0 of the Australian full text retrieval system ISYS is due for release in August.



PARALLEL READER™

Information processing is one of the most time-consuming and critical needs of modern corporations. As a result, many industries need high-volume, network-compatible OCR (optical character recognition): companies involved in republishing, industries that have substantial storage needs, and businesses with substantial information transfer requirements.

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The Parallel Reader recognizes text from any page, even if it's multi-columnar, "landscape" (sideways) or printed in any of eleven Western European languages. Recognizing virtually any typestyle from 6 to 72 points in size, the Parallel Reader automatically separates text from graphics and converts any dot-matrix, typed, typeset, or laser-printed font to the correct file format for editing in almost any word processor, spreadsheet, or database program. Included is a spelling checker, uniquely tuned to OCR, that operates in either automatic or interactive mode.

The key to the Parallel Reader's performance is its unique parallel-processor configuration. While other high-performance OCR processors assign different tasks for each page to separate processors for recognition, the Parallel Reader sends each page, in turn, to a separate processor board, allowing the recognition process to keep pace with scanner input.

Designed as a turn-key solution, the Parallel Reader includes two empty slots (for scanner and network interface cards) and four page recognition co-processor cards. With its fully-implemented Microsoft Windows™ interface, operating on a stable, standard 386SX platform, the Parallel Reader is a network-compatible, dedicated OCR machine running at the equivalent of 12 MIPS.

Features include the ability to scan multiple pages into single or multiple files, to scan and collate multiple two-sided documents, and to scan multiple pages of graphics into compressed or uncompressed TIFF files. The Parallel Reader can also perform simultaneous text and graphics processing, automatically saving each in its appropriate file format. Also included are features that allow the user to define multiple zone selections (up to 26 zones per page) on single or multiple pages, with user-defined delimiters for output-file compatibility.

The Caere Parallel Reader offers a cost-effective high-performance OCR solution, with unparalleled ease of use and installation.



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- Recognizes eleven Western European character sets
- Handles documents printed in either portrait or landscape orientation
- Differentiates columns automatically
- Differentiates graphics and text automatically
- Multiple zone selection
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- Built-in spelling checker, tuned for OCR
- Outputs graphics as compressed or uncompressed TIFF files
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System Includes:

- 16 MHz 386SX System
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- Parallel Reader Software (pre-installed)
- MS-DOS version 4.0
- MS-Windows, runtime version

Scanner Support:

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- Fujitsu 309x (series) with interface

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- Supported scanner (see above)
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Modem Features: • Procomm Communications software included, • Two-year warranty, • Hayes-compatible, • (CCITT) compatible, • Auto-answer, Auto-dial, Auto-speed detect, • Dual phone jacks, • 2400 - 1200 - 300 Baud Software selectable. R.R.P. inc. tax **\$575.00.**



SHARP — 4500 Series, 4600 Series 5541 P5700

Modem Features: • Procomm Communications software included, • Two-year warranty, • Hayes-compatible, • (CCITT) compatible, • Auto-answer, Auto-dial, Auto-speed detect, • Dual phone jacks, • 2400 - 1200 - 300 Baud Software selectable. Comes with RS232 25 pin serial port. R.R.P. inc. tax **\$575.00.**



APPLE

Modem Features: • Procomm Communications software included, • Two-year warranty, • Hayes-compatible, • (CCITT) compatible, • Auto-answer, Auto-dial, Auto-speed detect, • Dual phone jacks, • 2400 - 1200 - 300 Baud Software selectable. R.R.P. inc. tax **\$575.00.**



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External 5.25 inch floppy disk drive to suit Toshiba Laptop Computers. Includes internal power supply, so no additional load is placed on the computers power supply. Provides industry standard 5.25 inch, 360KB or 1.2MB floppy drive which is compatible with IBM systems. Comes complete with cables for plug and play use. R.R.P. inc. tax **\$714.00.**

GAHERTZ... REMEMBER, WHEN THINKING LAPTOPS, THINK MEGAHERTZ... REMEMBER, WHEN THINKING

CENSUS COMMUNICATIONS PTY LTD

5th Floor, 505 St. Kilda Road,
Melbourne, Vic. 3004.

Phone: (03) 267 4699

Fax: (03) 267 4226

REMEMBER, WHEN THINKING LAPTOPS, THINK MEGAHERTZ... REMEMBER, WHEN THINKING LAPTOPS, THINK MEGAHERTZ...

Unlike many products which require more RAM to run upgrades, ISYS 2.0 requires 20 per cent less RAM and 30 per cent less disk space than previous versions. ISYS 2.0 also features 90 new improvements, including an updating and index-building facility six times faster than ISYS 1.5.

Among other new features are context sensitive help, the capability to spread databases across multiple disk drives, and the ability to work with Windows and Word for Windows. Version 2.0 is also equipped with 'dynamic document activation' enabling users to activate their word processor and load a selected document from ISYS using only two keystrokes.

Current users of ISYS will be offered an upgrade for \$135. Those who purchased ISYS after 1st July 1990 will be given a free upgrade if they return their registration card prior to the release of version 2.0.

- **Distributor:** Odyssey Development, (02) 965 7250
- **Price:** Standalone, \$525; two-user LAN starter kit, \$995; upgrade, \$135

Aldus makes page 4.0

Aldus has recently released for the Apple Macintosh PageMaker version 4.0, a substantial upgrade offering over 75 new features. Most significant among these are the story

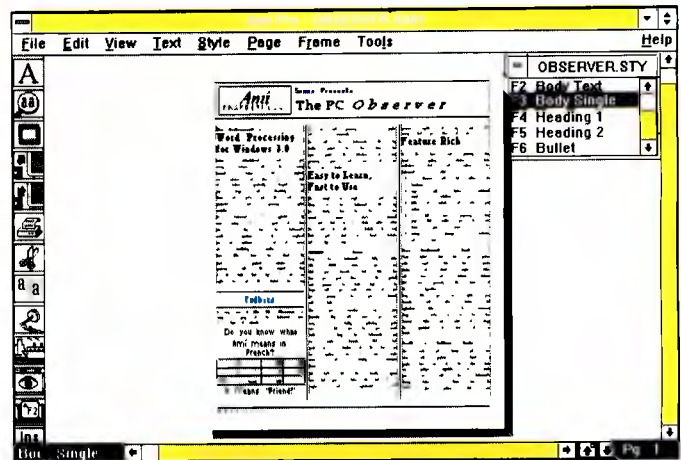


editor, links management, expanded typographic controls, index and table of contents over single and multiple publications, and expanded colour capabilities. Also included is a separate utility application: a table editor that can handle both text and graphics.

- **Distributor:** InfoMagic Australia, (02) 975 1044
- **Price:** \$1298; upgrades from version 3.0x, \$269 including freight and handling charges

1.2 for Ami Pro

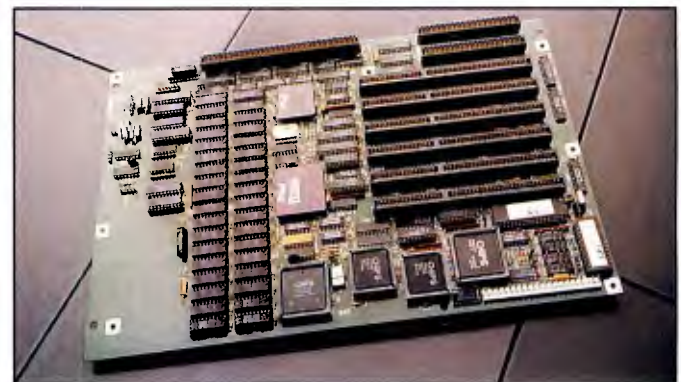
The graphical word processor from Samna now offers full compatibility with Hewlett-Packard's object-oriented NewWave environment and Microsoft Windows 3.0. Version 1.2 supports dynamic linking among NewWave applications for simultaneous updating of text or graphics among applications; DDE under Windows is also supported. Users may designate specific cells in tables as protected to prevent accidental editing, which when combined with the option for printing on ready-made forms give Ami Professional rudimentary forms processing capabilities.



- **Distributor:** Software Suppliers, (02) 888 1955
- **Price:** \$699; upgrade, \$50; with Windows 3.0, \$100

More boards, mother

Brisbane computer manufacturer, Western Computer has released an upgrade motherboard for the Compaq Deskpro 8086 and 286. The Hauppauge 386-DP20/4 is a 20MHz 386-based replacement motherboard. An advantage of this board



is that 2M or 4M of RAM can be installed on the motherboard. A 32-bit RAM connector allows memory expansion up to 64M of zero wait state memory in increments of 4M, providing a cheaper memory upgrade path for Compaq users.

Western Computer offers a one year warranty on all Hauppauge 386 products.

- **Distributor:** Western Computer, (07) 262 3122
- **Price:** With 2M DRAM, \$2000

Timbukthree-point-one

Farallon Computing's latest version of Timbuktu, version 3.1, allows a user at one Macintosh to observe and control multiple Macs on a network simultaneously. This capability is actually a form of groupware. Using Timbuktu, multiple users can work on a document at the same time.

- **Distributor:** NetComm, (02) 888 5533
- **Price:** Single user, \$199; 10-pack, \$1599; 30-pack, \$2999

When David Lindill went freelance it really had an impact on Kodak's bottom line.



As Manager of Financial Planning at Kodak, David Lindill is often required to present complex financial figures and scenarios to his colleagues.

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Show preview: Melbourne's PC90

Melbourne may be freezing in mid-August, but plenty of hot new products are expected to be on show at PC90 Melbourne. Kester Cranswick gives us a sneak preview.

Around 200 domestic and international exhibitors will be showing their wares to an expected 30,000 visitors. A subtle change from the organisers of the event is that the triple billing PC90, Office Technology 90 and Communications 90 shows are now being referred to as the one show. Apart from that, PC90 will be as exciting as the Sydney bash which attracted 192 exhibitors and 31,845 visitors in March.

Singapore and Taiwan have both taken large stands, with Singapore planning to have 17 companies exhibiting. AT&T Computer Systems is expected to keep the star spangled banner flying too.

Most of the PC big guns will be represented. Apple will be making a welcome return to the show, obviously keen to prove there is

more to life than Windows. Other major exhibitors include Amstrad, AST, Compaq (on the Sleebs stand), Epson, Hitachi, Kambrook, Mitac (represented by Keller Automation), Toshiba and Philips.

While many exhibitors are still finalising exactly what they will be able to launch, we already have enough new product details in the bag to promise an exciting show.

PC90 will be the first showing of Zenith's latest notebook personal computer, the MinisPort HD notebook computer, billed as the thinnest notebook PC ever. It has a 10MHz 80088 CPU, 1M of RAM, a backlit CGA display and a 2.5in 20M hard disk drive with a 23 milliseconds access speed and 1:1 interleave. An external 3.5in floppy drive runs off the system's power. The MinisPort HD operates for



Apple returns to the PC show with its fastest ever Mac, the IIfx



about three hours from a rechargeable NiCad battery pack. Rupp Corporation's FastLynx LX (a self-uploading data transfer program) and an abridged version of MS-DOS 3.3 Plus is stored in ROM.

AEG Olympia will be showing its new 386 laptop, the AEG Olympia Olyport. Toshiba is expected to have its first colour laptop on display, although its recently announced SPARC-based laptop Unix workstation won't make it. TECO Australia will have a new notebook computer and some new desktops. More details on these models closer to the show.

Staying on the desktop, Philips will be announcing its P3464-486 PC with EISA bus. It should be one of the most powerful PCs on the floor.

New Concept Technology will exhibit the Alpha range of microcomputers in-

cluding the Alpha 486, 33MHz and 25MHz 386 models, 20MHz 386 and 386SX, ATs and XTs.

In a networking vein, Comtech Communications will be showing Novell's NetWare operating system connected to a Unix host via TCP/IP, as well as Macintosh and OS/2 connectivity. Connectivity to a Vax with a new product called Terminal Emulation Services will also be demonstrated. The systems will be connected using Ethernet, Arcnet and Token Ring topologies, utilising coax and unshielded twisted pair cabling systems, linked with new remote LAN bridges from Microcom.

Wholesale Technology will show the Cubix range of bus-based networked workstations and background processors in a multi-topology network running Novell. The configuration demonstrates the flexibility that bus-based workstations



Notebook-sized portables are all the rage — this one's from Zenith

well as MNP Class 4 will be displayed.

OTC will be demonstrating its newly commissioned Switched Digital service, which links Australia to the international ISDN network. It will also have four facsimile machines and run video-conferencing sessions with represen-

can extend to an already cluttered network.

Wholesale Technology will also have the latest Xircom adaptors, including the first parallel port mux and high performance LAN cards from Lantana.

NetComm will be showing version two of the software for its PC Fax Card, which turns an IBM PC/XT/AT or compatible computer into a full speed Group III fax machine. Also on display by NetComm is the TrailBlazer modem, designed for dial-up connections between intelligent IBM SNA SDLC network devices, as well as asynchronous communications using protocols such as Kermit and Ymodem.

Speaking of modems, SmartModem 1234E and the AutoModem 1234E featuring MNP Class 5 as

tatives from Japan and the US.

There will be no shortage of new software to test. Micro Star, a new arrival from the US, will bring the latest shareware. Applications will include the Business Builder with programs such as Active Life, a planning, managing and tracking tool; As-Easy-As, a Lotus 1-2-3 clone; Contact Plus, an easy-to-use client tracking system; File Express, a powerful yet friendly database; Marketplus, a graphical stock and investment tracking package; Mass Appeal, a mailing list manager; and Medlin Accounting, a fast and simple double-entry accounting package. Micro Star will also show Galaxy, a powerful word processor.

Software Suppliers will have over 10 new products,



Market Plus, a shareware investment tracking package

including the latest software for Microsoft Windows. The highlight will be the Ami Professional word processor for Windows 3.0 and Hewlett Packard's New Wave environment.

Charismatek will be using PC90 to take the wraps off PerfectSolution, a document management application for networked environments.

PerfectSolution lets users find any DOS document in any application anywhere on a network, in seconds. It will automatically archive or delete documents after a given time period and allow filenames of up to 70 characters.

Australia Post will launch a new software package at Communications 90. Called ComputerLink, the software allows direct access to the Australia Post Lettergram Network, which delivers hard copy communication throughout Australia in around two hours. With the added feature of fax delivery, a ComputerLink user can communicate with any fax machine connected to the worldwide telephone network.

ComputerLink runs on DOS PCs

with a hard disk and 2M of disk space, a Hayes-compatible modem operating at 1200 or 2400bps and an Australia Post charge account. Once the ComputerLink software is installed the customer simply writes the message, selects the speed of delivery and enters a password to transmit the message.

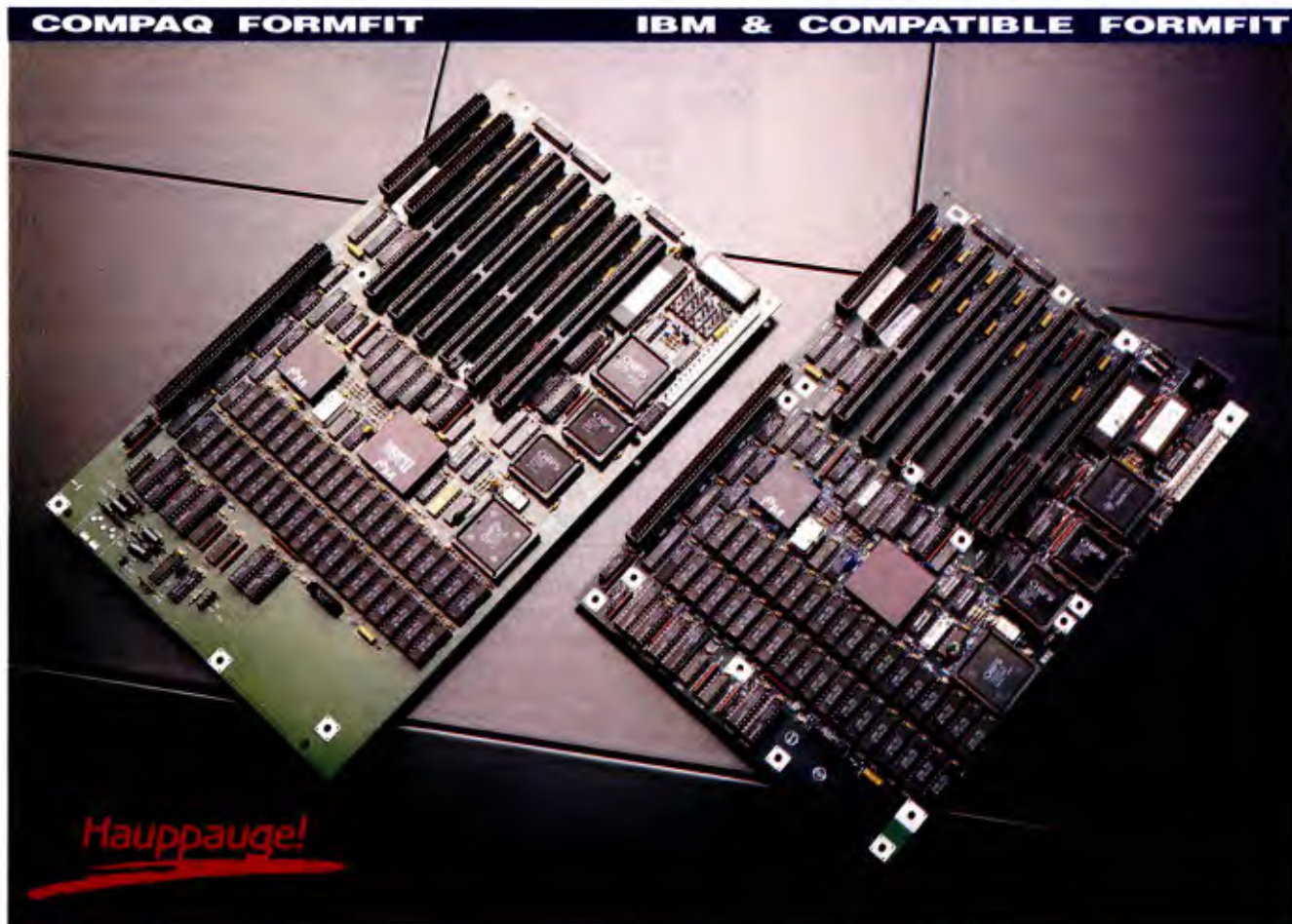
Grayta Solutions will have Natural Progression Accounting software on show. The software includes debtors, creditors, stock control, sales analysis, sales tax control and general ledger. It can cater for the small business with up to 50 debtors and creditors right up to the larger business requiring multi-department facilities in a multi-user or networked environment.

Computer Equipment News will show PC Globe software, a complete atlas on a disk. Softcover Software will be launching Alpha Four, a powerful relational database designed to be used by non-programmers. Straight out of Beyond 2000 will be the world launch of an Australian Hand Writing Recognition System, the first system of its kind to recognise both cursive and block hand writing. The system, from CAD Connection, can interpret hand writing and display it onto the screen for spell checking, editing and transmission via



Still the fastest: NetComm's Trailblazer

WESTERN 386 MOTHERBOARD UPGRADES



20Mhz Motherboards for IBM, IBM-compatible & Compaq computers

◆ 20Mhz MOTHERBOARD

Features include 2 or 4 megabytes of on-board memory, support for OS2, battery-backed clock and calendar and memory expansion up to 64 megabytes.

◆ THE SAVINGS

Using Western's Hauppauge motherboard upgrades, your existing computer system is given a new lease of life at a fraction of the cost of a replacement computer. A range of cost effective memory upgrades are available.

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The highly regarded Hauppauge Motherboards form the base of Western's 386 and 486 Product Range.



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◆ THE RANGE

Western Computer stock a range of motherboards in Brisbane for immediate delivery. This range includes 16Mhz, 20Mhz, 25Mhz and 33Mhz with cache, in formfit for IBM (PC, XT, AT) and compatible; Compaq (Portable, Plus and Deskpro).

Latest release 486/860 25Mhz motherboard.

◆ HAUPPAUGE

Specialist manufacturers of motherboards since 1984, Hauppauge Computer Works pride themselves on their ability to integrate the latest quality components into new products ahead of the competition.

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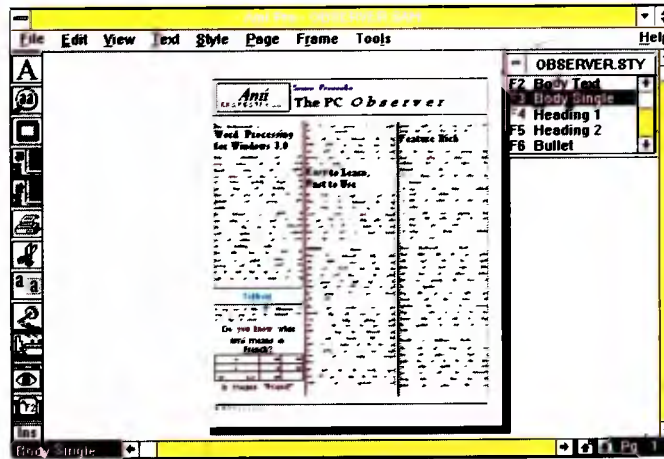
Phone _____

modem. CAD Connection will also show the Advanced IIT maths co-processor.

Sassy Software will have another futuristic new system using video imaging and optical disk technology. A camera takes a picture and then high resolution images may be stored or printed out with related details. The main advantage is the speed at which video images can be captured and printed on a standard laser printer. The base package includes a PC, a camera, a WORM or WORM optical disk, a mouse, a VGA monitor and a PostScript laser printer. At PC90 Sassy will take visitors' pictures and print them while they wait.

Other new storage products include the Kyocera 3.5in KC-40GA 40M hard disk. It has an AT interface, a 28ms access time, its own controller and 32K of cache memory buffer to provide fast effective access times of up to 10Mbps.

Look closely and you may find some new display technologies. ADV Technology will be introducing a multi-coated circular polarising monitor filter. The filter has been hand coated with four layers of special material and is more like a photographic lens.



A critical mass of support for Windows 3.0 has been reached: Ami Professional is now just one of several powerful word processors now, or shortly to be, available

Electroboard will be demonstrating its new PCV6 range of PC Viewers, which project 512 colours onto a screen. Electroboard will also show the only true colour liquid crystal display panel available in Australia.

A new release will be a means to attach the Electroboard Presentation Management System Model LS1 to capture and display screen images. The LS1 has a 1.44M disk drive and can store a sequence of up to 50 screens, with full video effects.

Another colour LCD display

unit will be on the Celcast stand. The nView Viewframe colour LCD projects colour images on to a large screen when connected to the video port of a computer.

Slidemaster will be taking a stand to show off its service in slides and overhead transparencies for multi-projector audio visual shows, speakers, presenters, managers and trainers. It can provide customer designed visuals, computer generated business graphics, location and studio photography, black and white laser print

proofing, an image library, cartooning, film processing and duplication, as well as PC slide imaging from a diskette.

For the Atari fan, Austech Computers will be exhibiting the new TT computer, a cartridge which enables an Atari to run Macintosh software and a new card that makes the Atari IBM compatible. CAD software and a new desktop publishing system called Calamus will also be featured.

The Melbourne PC User Group will be at PC90 to discuss membership, computing and problems with anyone who cares to call at the stand.

With over a month to go before the show opens, there are bound to be many more goodies released. We will have a further update next month.

The 15th Australian Personal Computer Show held at Melbourne's Royal Exhibition Building will open its doors on Sunday 12 August till Wednesday 15 August. The times are 10am to 7pm, Sunday to Tuesday; and 10am to 5pm Wednesday. The admission price will be \$10 and, as usual, unaccompanied children under 18 years will not be admitted.

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Would your
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if all your
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solutions
came from
one supplier?

What happens when something goes wrong in a computer network made up of components from different manufacturers?

The more suppliers there are, the more difficult it usually is to pinpoint a problem.

Does the fault lie with one of the computers? The software? A printer? Cabling? A modem? Phone lines? Perhaps even with someone using the network.

Any computer professional will realise what the advantages would be if all your equipment came from one computer company.

And if you're networking with NEC, you only have to make one call to solve the problem.

In the beginning.

After many years in Australia we're very much at home, as our distinguished Mr Ockamura is fond of saying.

NEC Information Systems can supply almost everything.

From the most powerful supercomputers and mainframes, to the smallest, most portable laptop. With a vast array of midrange computers, desktop PCs, printers, peripherals and accessories in between.

No other computer company makes a range of equipment that's so complete and some computer companies don't even make their own printers, let alone peripherals and accessories.

And our Research and Development never stops.

We've caught up with the future.

NEC make computers. But at the other end of the spectrum we also make sophisticated telecommunications equipment.

Computers & Communications or "C&C", has always been our motto. In fact, we could put together anything from a small Local Area Network to a vast Wide Area Network with simultaneous voice and data transmissions, starting tomorrow.

Not sometime in the future, but here and now.

No wonder we can say with such confidence: NEC we make networking work.

Our colourful reputation. (Thanks, Mr Ockamura!)

NEC quality control is legendary. Just ask anyone who owns NEC equipment.

Our products have gained recognition for being innovative and reliable which is quite a combination, when you think about it.

We've also become known for providing products that are "price sensitive", as they say in the trade.

Fantastic products, at a sensible price. What more could you ask for?

But no matter how large or small your computing requirements, you only have to deal with one supplier. NEC.

There's more to life than hardware.

We know that today it's not enough just to supply hardware.

Read on and you'll see we have a great range of high performance equipment and the service to go with it.

NEC Warranty.

NEC Warranty means all NEC products sold by NEC and our Authorised Dealers in Australia and New Zealand are guaranteed for a full 12 months.

No matter how big or small the equipment you'll find we stand behind the quality of our products.

Software.

We won't set you adrift without the most suitable software for your exact needs.

We have strong strategic alliances with the major software companies including, Santa Cruz and Microsoft.

In fact, NEC is Microsoft's second biggest customer worldwide.

We're also the only computer company in Australasia with a history of source code development with Novell. Which means we can customize your networking software without requiring support from the USA.

NEC Project Teams.

Special NEC Project Teams can help if you're not sure exactly what you need, in terms of hardware, operating systems and software.

If you have a complex technology based problem or project they're always available for consultation.

Whether you need MS-DOS, OS/2, Unix or integration with other propriety operating systems, our Teams can give you all the advice for the best solution.



Computa Care: a big idea.

We've developed a concept at NEC Information Systems called Computa Care.

When you buy equipment from us you'll find out what it all means. We provide skilful *Installation* by engineers. *Education*. On-going *Technical Assistance*. And when you need it, hardware and software *Maintenance*.

It all adds up to an after sales service package that we've put a lot of thought into.

NEC Finance.

You won't find many other computer companies who can put together a finance package like we can.

NEC Finance provides flexible financing options which can be structured to suit individual business needs, whether the equipment is rented or leased.

Where do I start?

You may be wanting to set up a network or simply looking for a laptop for an executive who's away from the office a lot.

It doesn't matter either way, because there'll be an NEC solution to suit you.

Within the NEC range of PC-based computers there are a variety of machines which could satisfy the user's needs.

If you're looking for a PC to act as a "server" to other "client" PC's, choose from the Powermate 486/25E, 386/33E, 386/25 or indeed the 386/20.

If you're looking for an individual or "client" machine to be part of a network or for use as a stand-alone PC or laptop, then choose from the Powermate 386/20, SX Plus, 286 Plus or 286 or one of our Prospeed Laptops.

If you're looking for a specific solution that is mainframe based, think about ACOS. (It's currently at the heart of large police and other government installations).

For a departmental file server have a close look at Businessmates.

Finally you'll also find a host of printers.

As you might expect NEC Authorised Dealers are conveniently located in major metropolitan areas and country centres.

For names and telephone numbers see the back page.

If you need a dealer who specializes in particular applications, phone NEC.

NEC

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If the answer is yes, we can do business.



Mr Ockamura. Very much at home in Australia.

Powermate Powerhouses

One was BRW Business Computer of the Year, one was the top selling business computer and they've all received critical market acclaim.

Today there are 9 models and many possible configurations to choose from.

Introducing the Powermate 486/25E (SERVER)

This is the biggest Powermate. Employing Extended Industry Standard Architecture (EISA), this file server will support up to 250 networked Workstations or 32 asynchronous terminals running Unix applications.



- 25 MHz 80486 microprocessor • 4Mb of high speed 32 bit system memory expandable to 32Mb • 100, 300 or 600Mb fixed disc capacity • 8 full sized expansion slots. EISA • Operating systems supported MS-DOS 3.3, MS-DOS 4.01, Windows 3.0, OS/2 with Presentation Manager, Novell NetWare 386, Santa Cruz Operation Unix Release 3.2, Microsoft LAN Manager.

Powermate 386/33E (SERVER)

The new Powermate 386/33E employs Extended Industry Standard Architecture and is the file server for networks up to 250 users or as a stand alone machine for such things as the power hungry needs of desktop publishing, CAD or detailed engineering design work.



- 33MHz 80386 microprocessor • 4Mb of high speed 32 bit system memory • 100 or 300Mb fixed disk drive • 8 full sized expansion slots. EISA • Operating systems supported MS-DOS 4.01, Windows 3.0, OS/2 with Presentation Manager, Novell NetWare 386, Santa Cruz Operation Unix Release 3.2.

Powermate 386/25, Powermate 386/20 (SERVER)

For desktop publishing, computer aided design, image processing and engineering calculations you need enough performance to operate efficiently.

The Powermate 386/25 has been designed with these applications in mind and can also be used as a file server supporting medium sized workgroups.

Not all applications require full 386/25 power. For these the 386/20 will be the best machine.

- 25MHz 80386 microprocessor • 2Mb of high speed 32 bit system memory (8Mb on the 300Mb file server) • 100 or 300Mb fixed disk drive • 8 full sized expansion slots • Operating systems supported, MS-DOS 3.3, MS-DOS 4.01, Windows 3.0, OS/2 with Presentation Manager and SCO Xenix.

Powermate SX Plus (CLIENT)

The Powermate SX Plus is the machine for high performance, but cost conscious users and will support numerous Windows or MS-DOS applications.

Ideally suited for many advanced applications. For example Windows 3.0 requires the benefit of working in a 386 compatible environment.



- 16MHz 80386SX microprocessor • 2Mb of high speed 16 bit memory • single floppy, 42Mb or 100Mb disk drives • 5 full sized expansion slots • Operating systems supported, MS-DOS 3.3, MS-DOS 4.01, Windows 3.0 and MS OS/2 with Presentation Manager.

Powermate 286 Plus (CLIENT)

For either secretarial or entry level executive applications like Word Processing, database, spread sheets and graphics the Powermate 286 Plus is an all round workhorse.

- 12MHz 80286 microprocessor • 1Mb of 16 bit memory • 5 full sized expansion slots • single floppy, 42Mb or 100Mb hard disk options • Operating systems supported MS-DOS 3.3, MS-DOS 4.01, Windows 3.0, and OS/2 Presentation Manager and NetWare 2.15.

NEC

W E M A K E N E T W O R K I N G W O R K

Powermate 286 (CLIENT)

Small in stature but boasting a powerful processor.

This entry level Powermate is the best PC for many business needs ranging from stand alone secretarial workstations with word processing to networked office applications.

- 10MHz 80286 microprocessor • 1Mb of 16 bit memory • single floppy or 20Mb hard disk options • 4 full sized expansion slots • Operating systems supported MS-DOS 3.3, MS-DOS 4.01 and NetWare 2.15.

You may require desktop power at home or away in the field with processing power to operate specialist software applications.

With the choice of either battery or 240 volt power, functionality is guaranteed no matter where the location.

In the office, if you want to you can simply connect the Prospeed to a Multi-Sync monitor for full desktop functionality.



- 16MHz 80286 microprocessor • 1Mb of high speed 16 bit memory • 20, 40 or 100Mb hard disk.

The fastest laptops on two knees

NEC Prospeeds provide heavyweight power in lightweight laptop form, with features usually found only on desktop computers.

Which means our Prospeeds are just as at home in a sophisticated network, as out in the field.

Prospeed 386

Best described as a highly flexible, portable, modular workstation, the Prospeed 386 can be used as a portable, or desktop computer with full capabilities, to run advanced MS-DOS applications and complex multi tasking environments. Windows 3.0, for example.

Its unique 'one-touch' docking station provides full expansion facilities of a desktop system with additional memory, communications and network cards available for installation.



- 16MHz 80386 microprocessor • 2Mb of high speed 32 bit memory • 40 or 100Mb hard disks • 3 internal expansion slots • battery pack for 2.5 hours of operation.

Prospeed CSX

NEC's first colour laptop is perfect for when Windows applications and on-board presentation graphics need to be achieved outside the office.

No longer are you bound by monochrome monitors which do not enable you to take full advantage of available colour applications.

- 16MHz 80386SX microprocessor • 2Mb of high speed 16 bit memory expandable to 4Mb • colour LCD display • 640 x 400 pixels • 42 or 100Mb hard disk.



Prospeed 286

For full desktop functionality outside or inside the office, the Prospeed 286 offers all the features required, but with the benefits of lightweight design.

NEC

W E M A K E N E T W O R K I N G W O R K

Businessmates mean big business

Introducing the Businessmate 486/25E and the Businessmate 386/33E.

These mid-range machines have greater processing power and storage capabilities which enable them to act as a file-server on a LAN of up to 250 workstations, and be a server for up to 64 terminals *at the same time*. (Of course, NEC Multiterm Terminals would be perfect.)



The operating system supported is the Industry Standard Santa Cruz Operation Unix Release 3.2 which provides access to over 2000 specialist applications.

It can also operate MS-DOS and OS/2 and, when using Novell's Network Operating System, can function in local or wide area networks, allowing for transmission between systems or transmission by direct links

to company mainframes.

While the Businessmate 486/25E supports up to 64 terminals, the 386/33E supports up to 32 terminals.

Businessmate 486/25E (SERVER)

• 25MHz 80486 microprocessor • 8Mb of high speed 32 bit system memory expandable to 64Mb • 140 or 300Mb hard disk storage expandable to 2.1 gigabytes • 11 full sized expansion slots. EISA.

Businessmate 386/33E (SERVER)

• 33MHz 80386 microprocessor • 8Mb of high speed 32 bit system memory expandable to 32Mb • 140 or 300Mb hard disk storage • EISA expansion facilities.

Printing: All you need to know

With all the effort you put into preparing your work on a computer you should never compromise the end result with an inferior printer, so choose NEC.

There'll be a printer or two to suit you in our range. Whether you need high speed draft print outs, letter quality, high resolution graphics, presentation material, desktop publishing or superb colour.

Dot matrix printing as sharp as a pin with Pinwriter P2200XE

All our Pinwriters have a 24 pin printhead, they're quiet and easy to operate and they all feature a wide choice of paper handling features and font styles.

This machine is an economical dot matrix printer for your home or office. The P2200XE has paper handling capabilities normally only found on much more expensive printers.

Impact 24 pin dot Matrix • high speed draft 192 cps • high speed letter • 80 cps • 28 built in type fonts • 8Kb of buffer memory • 5 to 10" paper width.

Pinwriter P6200 and Pinwriter P6300

The P6200 and P6300 are dot matrix printers for letter quality high speed printing.

Both feature a variety of paper handling options and are suitable for either a stand-alone situation or as a shared resource on a network.

The P6200 handles paper width to 10" while the P6300 can accommodate paper up to 16".

An innovation is its built-in memory which allows you to print one document while you work on another.



P6200 • Impact 24 pin dot Matrix • high speed draft 300 cps • high speed letter • 100 cps • 36 resident type fonts • 80Kb of buffer memory • 5 to 10" paper width • optional snap-in colour printing kit. Bottom feed for multi-part forms, low noise.

P6300 • Impact 24 pin dot Matrix • high speed draft 300 cps • high speed letter • 100 cps • 32 resident type fonts • 80Kb of buffer memory • 5 to 16" paper width • optional snap-in colour printing kit • Versatile paper handling with bottom feed for multi-part forms, optional dual bin stock feeder, low noise.

NEC

W E M A K E N E T W O R K I N G W O R K

Pinwriter P9XL

It runs at lightning speed.

The P9XL will output high volume quality printing fast and its in-built colour feature lets you create "eight-colour" documents with astounding results.

Impact 24 pin dot Matrix • high speed draft 384 cps • high speed letter • 128 cps • 12 resident type fonts • 16 48Kb of buffer memory • 5 to 16" paper width • colour version quiet • 53 inch BA.

The printers with the best name. The NEC Silentwriters

Eight pages per minute laser-quality printing. Low maintenance costs. Easy to operate. Efficient paper handling facility. And quiet as a mouse, as their name suggests.

The NEC Silentwriters are the printers for high quality presentation standard output needs.

Silentwriter LC890XL

The dual binned LC890XL Postscript page printer is the ultimate in desktop laser printing for use with heavy graphics requirements including desktop publishing. (The dual binned paper feeder can store up to 100 sheets.)

It's compatible with MS-DOS based PC's and is frequently used as a laser printer for Apple Mac's.

Perfectly comfortable in a networked or a multi-user environment.

Postscript • Laser Jet emulation • 8 page per minute printer • Fast 68020 microprocessor • 4Mb internal memory • 35 resident typefaces • high resolution printing 300 x 300 dots per inch • dual bin with 500 sheet paper capacity • Apple, RS232, Centronics interfaces.

Silentwriter 2-290

The Silentwriter 2-290 more than meets the demands of most graphics intensive desktop publishing projects.

There are 35 resident type fonts, postscript and 3Mb of internal memory so one page can be printed out while another is being composed so you can create first class documents that speak with authority, every time.

Postscript • Laser Jet emulation • 8 page per minute printer • 2Mb of memory expandable to 4Mb • 300 x 300 dots per inch • 35 resident type fonts • 3 standard interfaces Centronics, Parallel RS232c, Apple Talk • 200 sheet paper capacity.

Silentwriter 2-260

HP Laser Jet emulation means the Silentwriter 2-260 can be used with virtually any application software available.

HP Laser Jet Series II emulation • 8 page per minute printer • 1.5Mb of memory expandable to 5.5Mb • 300 x 300 dots per inch • 8 resident type fonts • 200 sheet paper capacity.



To add to our colourful reputation we introduce Colormate PS

Colormate PS is our first colour postscript printer and it should be your first too.

It prints the full Printers Pantone Colours on paper or overhead transparency.

It operates all the major graphics applications and for real colour representation, you won't find a more cost effective alternative.

Thermal transfer Postscript colour printer • 68020 microprocessor • 300 x 300 dots per inch • 8Mb of standard memory • 35 resident type fonts • standard interfaces • Serial RS232C/422C, Centronics, Local Talk, Apple Talk • 100 sheet paper capacity • cut sheet or transparency.



Accessories and hidden extras

Once you've invested in computer equipment it's just not worth the risk of using substandard consumables and accessories.

NEC can supply everything.

From a ribbon for your dot matrix Pinwriter, to a box of diskettes for your Powermate PC, to state-of-the-art ergonomically designed computer furniture.

No matter what you need to keep the ball rolling, we're sure to be able to help.

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Trilogy Business Systems (02) 692 8688
Phoenix Computer Systems (02) 959 4485
Network Link (02) 318 0088
Microhelp (02) 693 2544
Twinelle (02) 318 2544
Computerland Solutions (02) 319 3988

NEWCASTLE:

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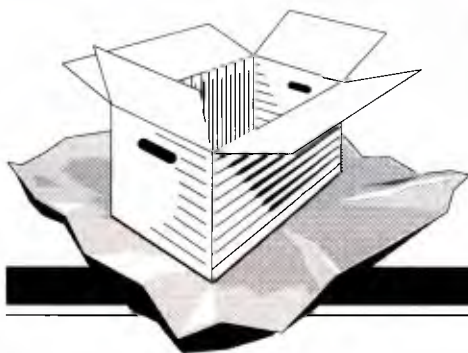
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W E M A K E N E T W O R K I N G W O R K



HyperCard — now with quasi compiler capability	Page 34
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Cobol lives: a remarkable development environment for OS/2	Page 38
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FIRST LOOKS

Windows 3.0 paints a rosier picture for Designer

Products like Designer 3.0, the latest version of Micrografx's leading drawing program, prove that PCs will play an increasingly important role in professional graphics. Windows 3.0 isn't a cure-all for Designer, but it's a powerful tonic. Under Windows 2.11 you had to reserve expanded memory for Designer's exclusive use in order to manipulate complex images, and even then there were problems. For example, although Designer's import function could move graphics from a disk file straight into expanded memory, interapplication cut-and-paste operations were bound by the conventional memory available to the Windows clipboard. Windows 3.0's direct use of extended memory makes the promise of Macintosh-style interoperability finally real for applications like Designer.

Still, life isn't perfect. Although Designer 3.0 runs more briskly on my 20MHz 286 machine under Windows 3.0 than under Windows 2.0, there's no getting around the fact that it takes quite a long time to render layered, vector-rich images to the screen. A math coprocessor would liven things up, so would a graphics coprocessor. Over the next year or so, two trends — the falling price of 34010-based display boards and rising demand for serious PC-based imaging software — will inevitably intersect.

For hardware vendors,

Windows 3.0 drivers are a high priority. At the moment, it's unclear how Windows' raster-oriented Graphics Device Interface can best utilise vector-oriented coprocessors. Designer 3.0's new outline fonts underscore the need for vector support: screen redraws crawl when you add lots of outline text to a drawing. The need will grow much more pressing when Microsoft incorporates TrueType into Windows. Windows' fate as a production graphics platform — and by extension, the fate of applications like Designer — will depend on the effective utilisation of advanced display hardware.

Designer 3.0 comes with two new accessories. Electronic SlideShow does on-screen presentations featuring PCX and TIFF colour bit-map support, transition effects and pre-rendering. The program's TeleGrafx Imaging Center Driver trans-



It's not quite up to Macintosh standards, but Designer 3.0 is a great leap forward in PC graphics

mits via modem and phone lines to service bureaus for conversion into 35mm slides, 4in by 5in transparencies, overhead foils and full-colour presentation prints.

Another bonus is a free clip-art library with more than 1700 professional-

quality images. Other new features include the ability to trace colour PCX and TIFF images and convert them to editable colour vector images; clip-art preview which allows you to see a piece of clip art before importing it; a Bezier curve drawing tool so you can set and edit Bezier control points while drawing; enhanced colour-separation controls; improved PostScript and Matrix (SCODL) film recorder drivers; and the ability to import the embedded TIFF portion of an Encapsulated PostScript file.

Micrografx advertises Designer as the 'cure for Mac envy'. Windows 3.0 adds considerable credence to that claim.

George Bond

At a glance

Designer 3.0

Distributor:	InfoMagic
Telephone:	(02) 975 1044
Price:	\$1298; upgrade from 2.0, \$250
Requires:	IBM AT or compatible with 1M of RAM, a hard disk drive, an EGA or VGA graphics card, a graphics monitor and a mouse or compatible pointing device
In short:	With Windows 3.0, Designer 3.0 moves PC graphics capability a step closer to that of the Mac.

Apple deals a faster, more flexible HyperCard

Apple's HyperCard program has been the major catalyst of the Macintosh's success in the multi-media and interactive training markets. The often-imitated program lets users manipulate data using the metaphor of a stack of index cards. In a smart marketing move, Apple bundled HyperCard with every new Mac, and HyperCard enthusiasts and commercial programmers responded by developing HyperCard stacks for applications ranging from teaching golf techniques to toolkits for composing music.

But, in spite of its popularity, HyperCard had been in need of some improvements, particularly when it is used for serious software development. The current version, 1.2, lets you work with only a single stack on the screen at one time. Also, the individual cards must be the size of the small Mac screen (512 by 342 pixels), and there is no support for colour. In addition, HyperCard 1.2 has limited tools for designing the visual appearance of each card.

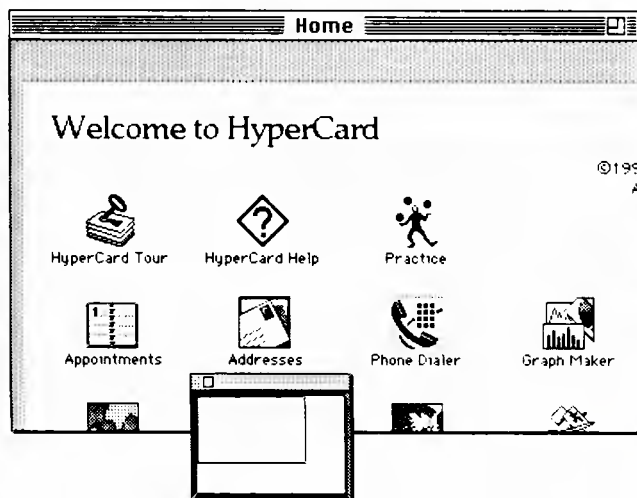
Apple's new version of HyperCard, version 2.0, changes all that. The new version supports multiple HyperCard windows on the screen simul-

taneously. The size of HyperCard windows can now range from 64 by 64 pixels up to 1280 by 1280 pixels. There are also some new external commands (XCMDs) that allow you to display colour PICT and grey-scale images.

Version 2.0 also includes new tools for creating graphical designs and visual effects on cards. There is a custom palette builder for designing control panels and other navigational tools. The new version also allows more flexible combinations of text fonts and sizes.

Probably the biggest improvements have been made to the HyperCard development environment. Version 2.0 includes a new script editor that can operate in a separate window while HyperCard stacks are also on the screen (the old editor took over the whole screen). There is also a debugger that can trace variables and perform step-by-step execution.

For increased performance, HyperCard 2.0 includes a quasi compiler, which compiles script commands at run time. However, although Apple calls it a compiler, the new system does not allow compiled binary data to be saved to disk. In other words, HyperCard com-



Unfortunately, HyperCard's new ability to compile scripts is limited by its inability to store the binary code on disk

At a glance

HyperCard 2.0

Distributor:	Apple Computer
Telephone:	(02) 452 8000
Price:	Unavailable at time of going to press
Requires:	Apple Macintosh with System 6.0.5
In short:	An improved HyperCard development environment including a new script editor and debugger, a quasi compiler and the ability to support multiple HyperCard windows on screen simultaneously are just some of the new features of HyperCard 2.0.

plies the script the first time it is initiated during a HyperCard session. Nevertheless, the technique does provide improved performance.

While Apple is often criticised for high prices, HyperCard is one of the best bargains available.

Nick Baran

Time Line 4.0 adds presentation graphics, mouse support

Symantec's Time Line has always been well regarded for offering an easy-to-use interface and an extremely thoughtful set of project management features. Version 4.0 improves on this tradition. Time Line now incorporates presentation graphics, which used to be a separate program, and has full mouse support.

In addition, you now can edit task data directly in the

Gantt chart, build extensive macros, draw both outline and traditional PERT charts, automate the WBS structure to suit your design, do resource levelling within slack, and enter resource allocation in hours. For these additional features Time Line costs \$1050, \$150 more than version 3.0.

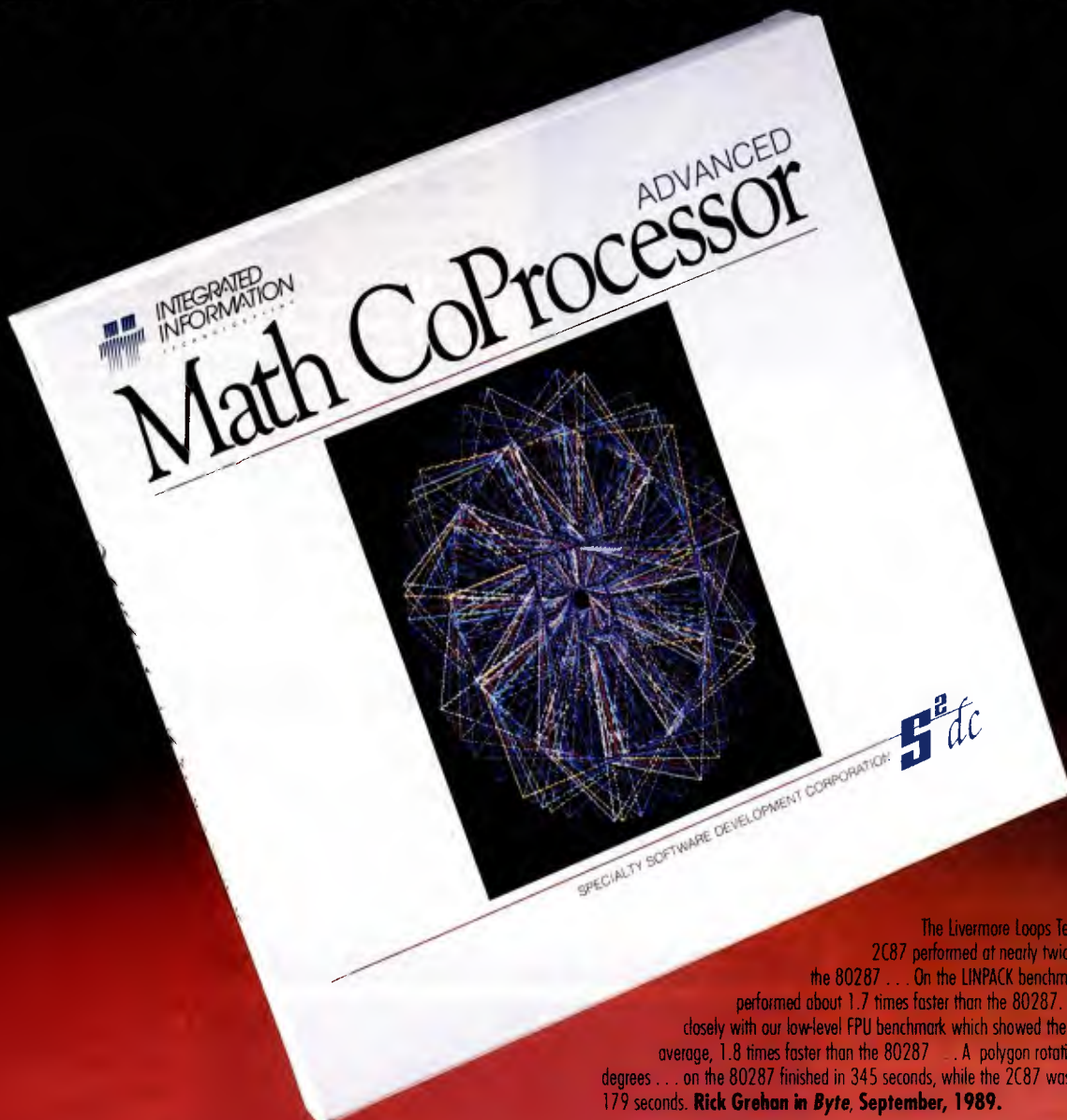
To add graphics to Time Line, Symantec didn't just throw in its old Time Line

At a glance

Time Line 4.0

Distributor:	PC Extras
Telephone:	(02) 319 2155
Price:	Time Line 4.0, \$1050; upgrade from Time Line 3.0, \$300; upgrade from Time Line 3.0 with Time Line Graphics, \$225
Requires:	640K RAM, hard disk, DOS 3.0 or later
In short:	This substantially upgraded version makes Time Line the product of choice in the low-end project management arena.

TIME MACHINE



IIT — The New Standard in Coprocessors

The IIT range of coprocessors delivers performance superior to Intel's 80287 & 80387 coprocessors and they are available NOW!

Guaranteed up to 200% faster than Intel, on Intel's own benchmarks, IIT co-processors are guaranteed 100% Socket and Software compatible or your money back.

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- Low power consumption. CMOS design makes our chips ideal for laptops. Power consumption is 1/4 that of old fashioned coprocessors. A unique sleep mode cuts power consumption further, lengthening battery life.

The Livermore Loops Test showed the 2C87 performed at nearly twice the rate of the 80287 . . . On the LINPACK benchmark the 2C87 performed about 1.7 times faster than the 80287. This agreed closely with our low-level FPU benchmark which showed the 2C87 to be, on average, 1.8 times faster than the 80287 . . . A polygon rotation through 360 degrees . . . on the 80287 finished in 345 seconds, while the 2C87 was done in only 179 seconds. **Rick Grehan in Byte, September, 1989.**

- The 2C87 (80287 compatible) includes all the instructions added by the 80387, as well as a new instruction that vastly speed up 3-D graphics. The 4-by-4 element matrix transformation speeds up 3-D operations up to eight times faster than an 80287 and three times faster than an 80387 — with the ability to run on 80287 machines at a true 20MHz as a bonus. A unique floating point architecture gets the job done faster, by using far fewer clock cycles.

- An IIT Coprocessor is an investment in the future. Major CAD & other software companies are committed to writing their software to use the IIT's unique functions. Don't get caught with an obsolete coprocessor.
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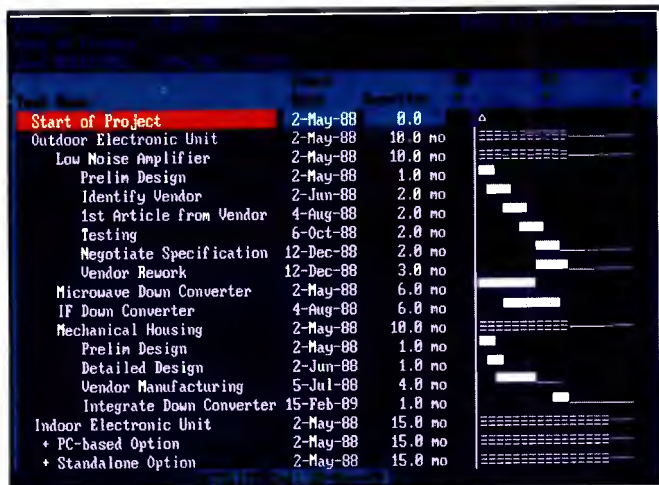
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The IIT Coprocessor Range — we've got you covered

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	2C87-10 (10MHz)	(replaces 80287-10)
	2C87-12 (12MHz)	(replaces 80287-12)
	2C87-20 (20MHz)	(not avail. from Intel)
80386SX Computers	3C87SX-16 (16MHz)*	(replaces 8037SX-16)
	3C87SX-20 (20MHz)*	(replaces 8037SX-20)
80386 Computers	3C87-20 (20MHz)	(replaces 80387-20)
	3C87-25 (25MHz)	(replaces 80387-25)
	3C87-33 (33MHz)	(replaces 80387-33)

*Available June 1990



Time Line 4.0 can display as many as five resource histograms at the bottom of the Gantt chart screen

Graphics program. Instead, the company spent two years writing a totally new set of facilities that give the

program true presentation-quality charts. You can control the font size of letterforms; use proportional

spacing; choose colours for every aspect of a chart, including the background; use rounded corners; change line thickness; customise the titles and legend; annotate the chart; and use special symbol sets.

Although Time Line is still a character-based program, you can see a WYSIWYG preview of your output before you print and zoom in on a section in detail. Charts can be scaled manually up or down in size to change awkward page breaks, or they can be forced to one page. Symantec has also rewritten Time Line's printer drivers; the program includes drivers for PostScript printers and devices for producing 35mm slides, colour overheads and transparencies.

Time Line's mouse sup-

port and its ability to accommodate editing in the Gantt chart (its most important project view) make the product even easier to use. Two macros for quickly generating a schedule and graphic output come with the package, as do libraries of preformatted Gantt chart layouts, filters and colour palettes.

Several other new features, such as the WBS Manager, the enriched import/export facilities and cross-project task linking, allow you to integrate project data with other applications and distribute project control for a network. All these new additions help Time Line 4.0 maintain its pre-eminent position in the low-end project management field.

Henry Fersko-Weiss

Control Room configures computers with compact custom TSR

If you use half-a-dozen memory-resident utilities to configure your system with a cache, a command stack, keyboard macros and more, Control Room can replace them with a single customised utility. And if you don't use any programs to configure your system, Ashton-Tate's \$185 do-everything utility is designed to make the job effortless.

Control Room creates a customised TSR to configure your system with only the functions you choose from a series of menus. You can include keyboard, disk and general DOS management functions, some of them normally not available or only in small utilities. Because you select the features you need, Control Room's custom TSR can be as small as 2.5K, but if you want to take advantage of the full range of features, the TSR will typically occupy 12 to 25K, plus as much expanded or extended memory that you assign to an optional disk cache.

You can take control of the keyboard (expanding the

buffer that stores keystrokes until your application is ready to receive them) by adjusting the typematic rate, setting the initial state of the lock keys and swapping the

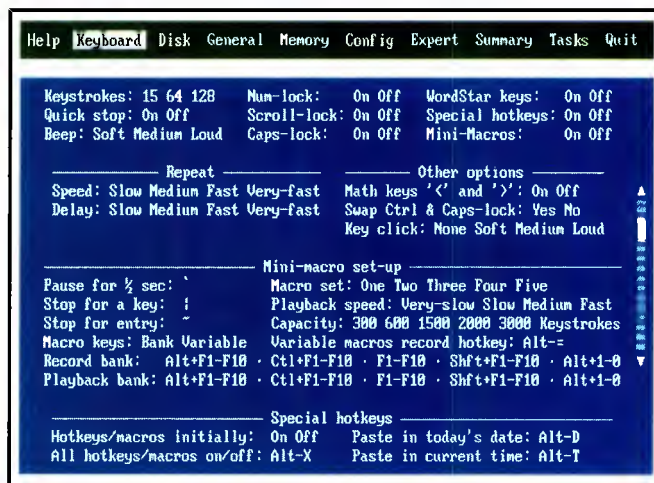
period and comma keys generate periods and commas instead of angle brackets. (When the shifted comma key prints as a comma rather than as an

Control Room allows you to install up to five sets of different macros, assigned either to shifted states of the function keys or, in a slightly different option, to any keys you choose. The program also offers optional hotkeys that can paste the date or time into an application — or the time elapsed since you pressed a hotkey that turns on a stopwatch function.

Its disk cache can be installed in conventional, expanded or extended memory, and optionally reads a full track every time it reads the disk. You can also install a disk-parking program.

Control Room's general functions include screen blanking, a command stack allowing you to cycle back through previous DOS commands (but only holds 256 characters) and a daily scan for viral attacks. You can disable Shift-PrtSc, turn off a numeric coprocessor or redirect printer output to a file.

Other functions, only



Control Room's keyboard macros include built-in functions and multiple sets of customisable macros

Ctrl and Caps Lock keys on enhanced keyboards. You can also add a keyclick (soft, medium or painfully loud) and make the uppercase

angle bracket, you can't access the angle brackets at all. It makes more sense to assign the angle bracket to the Alt state of the comma.)

GO!486▶

**97% of the performance of a Compaq 486
for 20% of the price!!**

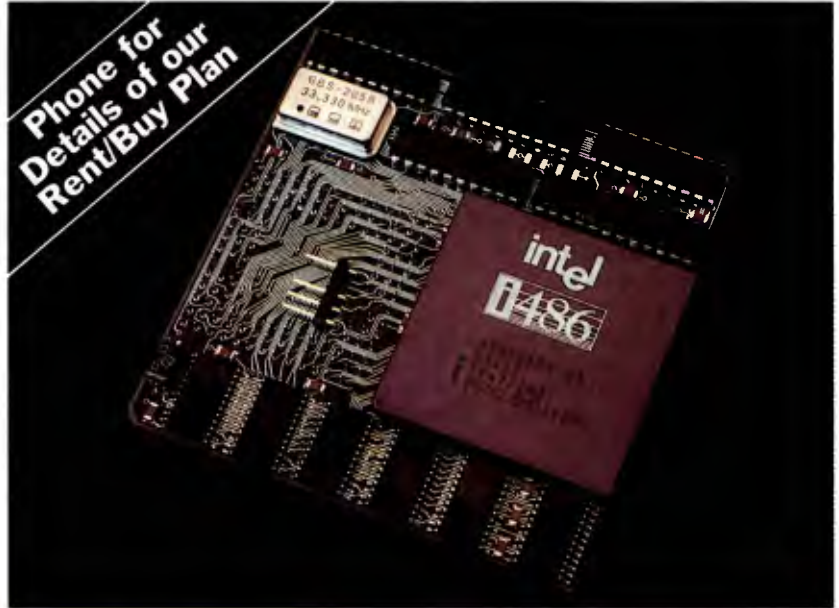
GO!486 is a plug-in daughter board that replaces your 16/20/25MHz 386 and 387 processor to deliver **full zero wait-state 486 power**, in minutes. By using on-board caching, all GO! boards achieve zero-wait-state performance while allowing the motherboard to run at its original speed.

GO!486 is a fully functional 33MHz 486 Processor Platform that provides all the power of a 33MHz 486 motherboard when used to upgrade any 16/20/25MHz

motherboard.

Due to the "computer on a chip" design of the 80486, GO!486 achieves 97% of the performance of a 486 motherboard, for a fraction of the price.

If you have a slow 16 or 20MHz 386 machine, such as an **IBM Model 80** or **Compaq Deskpro 386**, then GO!486 is the perfect upgrade. It can be installed in minutes. No need to reformat your hard disk or transfer data. No compatibility problems, since disk, video and processor



"It seems that the i486 (processor chip) is so self sufficient that these tests (comparisons between i486 computers) can be performed without too much reference to the rest of the system"

APC May '90

BIOS remain the same.

No need to re-install complex network software. No downtime.

GO!486 is 100% compatible with all PC software, including MS-DOS, OS/2, UNIX, XENIX and Novell Netware.

GO!486 performance improvements

The tables opposite show the benefits achieved when the GO!486 board is fitted to 16MHz and 20MHz systems such as Compaq and IBM. Even greater benefits will be found when the Platform is fitted to 25MHz systems. GO!486 has been designed as a drop in replacement for Compaq and IBM systems and fits most other systems. It is compact and low profile and can fit under expansion cards.

Original 16MHz System		With GO!486 installed
SI (v4.0)	17.6	51.5
MIPS (C&T)	2.06	6.39
Whetstones	496	2847

Original 20MHz System		With GO!486 installed
SI (v4.0)	22.5	51.5
MIPS (C&T)	2.60	6.39
Whetstones	596	3001

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Has full coprocessor support

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available from the configuration program that you run from the DOS command line, let you encrypt a file or delete it beyond recovery. A built-in editor allows you to modify your CONFIG.SYS and AUTOEXEC.BAT files and enables or disables commands in both. You can run Control Room on a network enabling the system administrator to restrict access to the program's functions with passwords.

Unfortunately, Control Room's TSR refuses to load in high memory on 286 or 386-based systems. If you currently store your TSRs in high memory, you may lose more RAM by switching to Control Room than its all-in-one efficiency lets you gain.

But the program's powerful macros may be a more than adequate compensation. Because Control Room dispenses with pop-up screens and other niceties found in advanced packages like Keyworks, its macro functions occupy as little as 8K of RAM whereas other

At a glance

Control Room

Distributor:	Ashton-Tate
Telephone:	(02) 953 9500
Price:	\$185
Requires:	384K RAM, DOS 3.0 or later
In short:	A unique utility that combines functions of multiple TSRs (including advanced keyboard macros) into one customised and compact TSR. It won't load into high memory on 286 or 386 systems.

packages need 60K or more. One ingenious option in Control Room lets you use the WordStar cursor control keys in almost any application by translating the WordStar 'diamond' into arrow keys.

Except in its macro features, Control Room offers few advantages over standalone utilities beyond the efficiency of using a single, automatically installed program. You can find better DOS command-line stack programs, like CED, on any BBS, and you can get a better cache program in com-

mercial packages like Super PC-Kwik.

Control Room's menus are almost aggressively hyperactive, with help windows sliding sideways into the screen and dizzying scrolls from one menu to the next. You can quiet it down from a special system administrator menu. My system locked up whenever I tried to exit this screen unless I ran the program from an absolutely clean DOS.

Control Room tests your system and presents, a long-winded report in intelligible English on its disk, memory

and video. In my system, this report got some crucial details wrong. It said I should upgrade my DOS version from 4.0 to 4.01 — even though I already use 4.01. It told me I had 5M of free expanded memory — even though the extended memory is already occupied by the expanded. It couldn't tell the difference between phantom drive letters created by the SUBST command and drives actually on my disk.

Most of this long system report tells you what you probably already know: that an XT is slow, that a 386 machine is fast and that a hard disk with 300M is very large.

Control Room's TSR, however, is a lot more compact and intelligent than its system report. For anyone who wants macros and system configuration in a single TSR, and doesn't mind loading them in low memory rather than in high, Control Room is the best and only choice.

Edward Mendelson

COBOL programmers to write PM, DOS and mainframe applications

For COBOL programmers, gaining the proficiency in C to develop applications for the OS/2 Presentation Manager means a significant investment of time. Now, there's less reason to switch to a new language. Micro Focus has cut down the need for extensive retraining by providing support for the OS/2 Presentation Manager Application Program Interface (API) in its COBOL/2 set of products.

What's the connection between COBOL, a first-generation language and the OS/2 Presentation Manager? The COBOL 85 standard, which is fully supported by COBOL/2, handles many of the data types and control concepts required in PM applications.

Version 2.4, the latest release of COBOL/2, offers a batch of new features,

among them enhanced PM support for COBOL, extended memory support for DOS, a report writer, embedded SQL execution from

within COBOL, multiple-thread support within OS/2 and Animator support under PM. The COBOL/2 software development kit (SDK) in-

cluding the compiler and the Toolset, \$3000; and the all encompassing Workbench with SDK, \$6000.

The COBOL/2 language handles recursion, local data storage, non-COBOL calling conventions, parameter passing by value, receiving values from external routines (or the operating system), pointer data types, and the assigning of addresses of functions or procedures to variables. Not only does the new version accommodate multiple threads, it handles long filenames (up to 64 characters), bit manipulations, and provides a utility for converting C header files for OS/2 into COBOL formatted files. Other features include COBOL Source Information (CSI), which organises and identifies dead code and indicates how programs are structured; Fileshare, a transaction log-

The screenshot displays the COBOL/2 interactive debugger. On the left, a list of program-body section lines is visible, including '331 program-body section.', '332 evaluate true', '333 when DS-EXIT-FIELD-TRUE', and others. On the right, a 'Structure-diagram' shows a hierarchical view of the program, with 'PROGRAM' at the top, branching into 'PROGRAM-BODY' and 'PROGRAM'. Below this, a table lists various fields and their values, such as 'FLAG-CANCEL-', 'SETUP-KEY', 'SAVE-SEARCH-', 'MOVE-FOUND-', 'DS-EXIT-FIELD-TRUE', 'CONF-TITLE', 'CONF-INITIALS', and 'BB'. At the bottom, a status bar shows 'Level=02-Speed=5-Ins-Caps-Mem-Scroll' and a list of function keys (F1-F10) and their corresponding actions.

Under OS/2, COBOL/2'S interactive debugger allows you to examine an application in one screen while it runs in another

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ging and recovery file server for client/server applications; and Co-Writer, a screen and report painter.

SQL support in COBOL/2 allows developers to execute SQL commands for DB2, XDB, OS/2 Extended Edition and SQLBase from within their COBOL programs. The Animator, COBOL/2's interactive debugger, now lets you debug PM applications in one screen group under OS/2 while the application executes in another screen group. Thus, developers who have two monitors can debug their PM applications and control the input/output to their programs separately from the debugging tool.

PANELS, an API for SAA/Common User Access (CUA) applications that is callable from COBOL/2, supports mouse input, dialogue boxes, menus and scrollable text. Applications that use PANELS can execute under DOS or PM or in OS/2 character mode — without it being necessary to change the source code in the application. Since COBOL/2 is IBM platform independent, you can create applications that will run on DOS or OS/2-based PCs, AIX-based machines and System/370s, all from within a single

At a glance

COBOL/2, version 2.4

Distributor:	Infoclink Software
Telephone:	(02) 318 9333
Price:	COBOL/2 SDK (compiler and Toolset) \$3000; COBOL/2 Workbench plus SDK \$6000
Requires:	DOS version: 2M RAM, hard disk, DOS 3.3 or later; OS/2 version: 6M RAM, 9M of available disk space, OS/2 1.1 or later
In short:	A complete PM applications development environment with an interactive debugger (Animator), an editor, source code utilities, SQL support and a screen/report painter. Handles multiple threads, long file names, bit manipulations and includes a utility for converting C header files for OS/2 into COBOL formatted files. Can be used for creating DOS and OS/2 applications as well as for off-loading mainframe applications development onto the PC.

development environment.

The COBOL/2 Workbench runs in a text window under PM, and is best used in full-screen mode. It lets you compile, edit and debug (Animate) at the same time under OS/2 (using multiple threads). The Workbench also offers concurrent execution under DOS.

COBOL/2's integrated environment will allow newcomers to acquaint themselves with the program quickly. From the Workbench menu, the product's editor, checker, compiler, Animator and utility functions are just a keystroke away. (If you're

using OS/2 1.1, a bug in that version of the operating system prevents the COBOL/2 Workbench from displaying the Alt and Ctrl menu options in a full-screen window; OS/2 1.2 remedies this problem.)

The Workbench offers online help, a complement to the massive documentation that comes with COBOL/2. Also, excellent sample programs, each of which is extensively documented and includes descriptions of the concepts used, serve as models for imitation. A PM calculator program makes use of all the major PM calls. This program includes

sample resources (windows, dialogue boxes, etc), accelerator keys, child windows and a standard client window procedure. COBOL/2 also comes with a document that describes in detail the extensions made to COBOL to support PM.

Still, learning how to program for the OS/2 Presentation Manager will take some time, regardless of which programming language you use. As they would with any windowing operating system, COBOL programs that run under OS/2 PM must respond to asynchronous messages and must be structured quite differently to traditional COBOL programs.

Micro Focus has made practical the concept of off-loading applications development in COBOL from mainframes to PCs. For developers who are thinking about writing applications for the OS/2 Presentation Manager, Micro Focus COBOL/2 is an excellent alternative to C or Assembler. For those who need to develop SAA/CUA-compliant applications using COBOL, Micro Focus COBOL/2 is the only real option available for PCs. And for everyone else who programs in COBOL, this development tool is a *tour de force*.

ToolBook puts Windows development in the hands of power users

You don't have to be a programmer to create applications for Microsoft Windows 3.0. ToolBook, a self-styled 'software construction set' from Asymetrix, is designed for anyone who wants to create Windows programs, ranging from the simple to the complex. The \$595 package is as easy to use as a paint program, requires no experience with traditional programming languages, and makes it a cinch to build applica-

tions that integrate graphics, hypertext and animation.

What kinds of applications can you build with ToolBook? Prototypes, Windows front ends to databases, vertical applications integrating text and graphics, courseware and training packages that require animation — the list is almost endless. But because of the performance issues, you'll probably want to avoid using ToolBook for time-critical applications such as communications

programs unless the application code is contained in a Dynamic Link Library (DLL) written in C.

The programs you create with ToolBook can be distributed royalty-free. Since every copy of Windows 3.0 comes with a runtime version of ToolBook, you'll have a ready-made installed base that can use your ToolBook applications.

ToolBook is object oriented in the sense that the programs you create are

composed of objects that perform actions. ToolBook applications are organised in files called 'books', with three levels of password protection and multiple pages. Each page has a foreground and a background composed of buttons, fields, graphics and 'hotwords', which are hypertext links to other pages, books and objects.

You can create an object easily by selecting it from a palette, drawing it with the built-in colour-drawing tools; or pasting in clip art or scanned graphics from the Windows Clipboard. Since each object exists in its own layer, you can overlap objects or group them to act as

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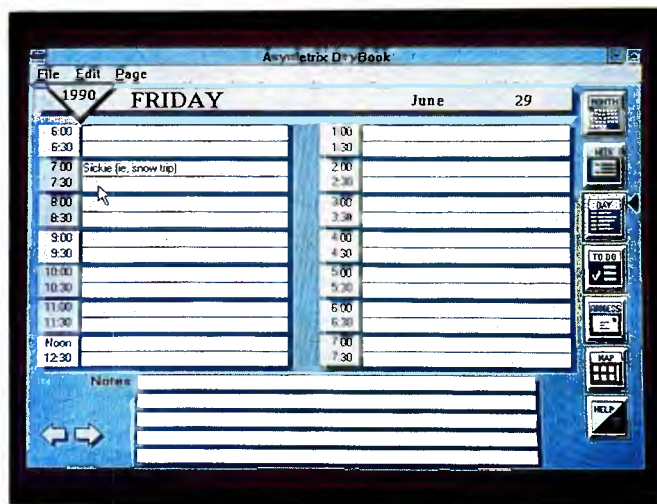
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FIRST LOOKS



In addition to a runtime version of ToolBook, Windows 3.0 comes with two books. Shown here is the DayBook

a unit. And, since a page can share a background with other pages, building screens and images requires a minimum of overhead and effort.

Each ToolBook object has properties that control its appearance and actions. For instance, you can link one object to another, so that a user's mouse click will cause the object to call (and optionally, return from) another one. Each object can have a script associated with it that dictates the actions ToolBook will take when a user points to or selects the object.

You write ToolBook scripts in the program's OpenScript programming language, which offers an English-like syntax. For ex-

ample, to initialise a variable, salesForecast, to 100, you would write 'put 100 into salesForecast'. ToolBook sports script editing and debugging windows for OpenScript programming.

But you don't have to write OpenScript code to create ToolBook applications. Most of the job can be done by modifying an object's properties (via a Properties Dialogue) and by using the built-in script recorder. The latter will record nearly every ToolBook operation (including object movements), allowing you to animate any object. Thus, you can write your own scripts, or ToolBook will generate them for you.

At a glance

ToolBook

Distributor:	Solutions
Telephone:	(075) 39 5422
Distributor:	Software Suppliers
Telephone:	(02) 888 1955
Price:	\$595
Requires:	Microsoft Windows 3.0, 640K conventional memory and 256K extended memory (1.5M total recommended), hard disk with 2M available storage (8M recommended), mouse, EGA or VGA monitor, DOS 3.1 or later
In short:	A complete Windows 3.0 development system designed for power users and developers alike. Provides a point-and-shoot environment for using standard controls, graphics and hypertext in Windows applications; a full-featured programming language; and animation facilities. A must for anyone writing Windows applications.

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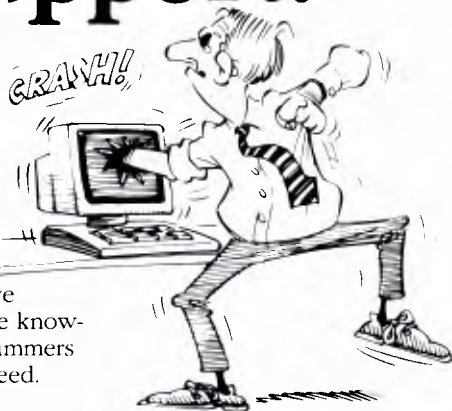
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FIRST LOOKS

ToolBook doesn't limit you to the 100 commands and functions built into OpenScript. You can define your own functions or access any functions found in any Windows DLL. This lets you extend ToolBook indefinitely since you can create your own DLLs. A number of these are provided in the package, including interfaces for using Windows Dynamic Data Exchange (DDE) and accessing dBASE files.

ToolBook comes with several ready-made books, including the DayBook, a daytimer/personal organiser; QuickTour, an online guide to ToolBook; an Animation Primer; books of script and page ideas and clip art; reference books for using the DLLs; a hypermedia tutorial; a calculator; and the Book-Shelf, a book that catalogues all the rest. You can modify and copy these books, and paste their scripts into books of your own. (In addition to a runtime version of ToolBook, Windows 3.0 includes two books — the DayBook and Introducing ToolBook.)

As if the program wasn't already easy to use, a pop-up command window is available for issuing OpenScript commands directly.

Performance-wise, ToolBook isn't a speed demon — but it's not a hog, either. Books run at an acceptable speed (depending on the operation involved, of course), but they're not as fast as Windows applications written in C. This isn't a serious problem, but it's the one spot where Asymetrix could still improve this otherwise excellent product.

By putting a sophisticated yet easy-to-use development environment in the hands of power users, ToolBook may go a long way toward determining the direction that applications development will take in the next decade.

Whether you're a skilled Windows developer who wants a tool for rapid prototyping or a power user who wants to create Windows applications quickly but with little or no programming, ToolBook will fit the bill.

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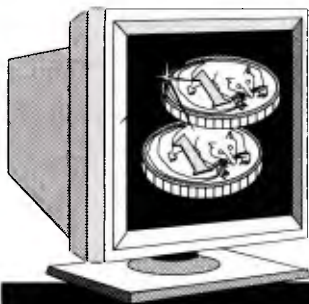
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TWO BITS WORTH

In my last column I identified some of the obstacles standing in the way of OS/2's acceptance, and recommended that both Microsoft and IBM do more to remove them. Without their action, I suggested, it is possible that OS/2 will not be successful.

Clearly, if Microsoft and IBM fail to establish OS/2 as the heir to DOS for office systems, Unix will be the primary beneficiary. Worsening prospects for OS/2 translate into better prospects for Unix.

But don't chill the champagne for Unix's victory celebration just yet: as an operating system standard for office desktop PCs, Unix has problems of its own.

First, contrary to claims made by its enthusiasts, Unix is far from being the single standard that it is sometimes made out to be. Granted, considerable progress has been made towards standardisation among Unix versions over the last 10 years. Nevertheless, Unix remains a more heterogeneous collection of implementations than you might expect.

The idea that source code for Unix applications can be recompiled for various hardware platforms remains, in principle at least, a far leap from the kind of off-the-shelf compatibility that has characterised DOS software products and will characterise OS/2 applications as well.

One of the most important strengths of DOS has

been that it wasn't just a software standard — it was a hardware standard as well. The architecture of the IBM, PC, XT and AT, designed around the Intel microprocessor architecture, was as much a part of the standard as was DOS.

That combined software/hardware standard created a common platform for software developers, allowing them to generate object code that would run on a wide variety of systems, and creating for them the enormous market for applications.

While it is possible to run a particular Unix version on a wide variety of 386 and 486-based systems, the overall Unix market is far more fragmented than the DOS market has been and than the OS/2 market will be. Not only are there competing versions of Unix, even for Intel-based systems, but there are numerous implementations for other architectures that are not compatible at the binary level with one another.

Unix partisans, of course, emphasise the virtues of being able to run the operating system on various hardware platforms. They argue that this should make it much easier to take advantage of, for example, the superior performance of newer, RISC-based microprocessor architectures.

However, in reality, the newer architectures have not yet delivered practical price-to-performance ratios that are significantly superior

to those of the more recent versions of more traditional architectures like Intel's. By the time they do (and if they do), there are good chances that portable versions of OS/2 will be available as well.

Yet another dimension of Unix market fragmentation is reflected in the plethora of competing, incompatible graphical user interface (GUI) alternatives for Unix, in spite of the existence of the low-level X Window standard. Open Look from Sun Microsystems and AT&T vies with the OSF/Motif GUI from the Open Software Foundation. And then there is also Steve Jobs' NextStep interface. All three are competitors for the loyalties and energies of not only users, but also of software developers. The result is that the Unix standard remains elusive in practice.

Then, too, there is the matter of compatibility with existing DOS applications. The various DOS-under-Unix options have not turned out to be as usable in practice as they appeared to be in theory. Even OS/2's often-maligned DOS compatibility box of early versions has done a much better job at running DOS applications than the Unix-DOS merge alternatives.

As OS/2 gains substantially improved capabilities in running DOS applications, Unix alternatives start to look far less appealing as a migration path for DOS users. The transition to OS/2 comes far more easily.

That is also due, in part,



Unix isn't quite the standard it's made out to be. But William Zachman says that's a big advantage for OS/2

to the similarity between OS/2's underlying command structure and that of DOS's familiar C:\> prompt. Learning how to use OS/2 isn't very difficult for reasonably sophisticated DOS users. Unix, however, remains a strange and foreign environment by comparison.

Further, contrary to what many think, growing use and improved versions of Microsoft Windows have actually strengthened OS/2's prospects rather than weakened them. That's because it is even easier to

migrate to OS/2 from Windows than it is from DOS. Window's recently enhanced capabilities, far from hurting OS/2 in the long run, serve instead to smooth the way for its adoption.

Lacking a knockout punch for a truly decisive victory over OS/2, Unix's prospects for success remain limited. OS/2's DOS-related heritage naturally gives it an advantage in the vast majority of user sites. Even though current use is still modest, OS/2 is already in place as the successor to DOS.

Like an army trying to take entrenched positions from a defender, Unix will need both superior numbers and weaponry to prevail. As it stands, however, the sides are about even.

So, despite the questions that I have asked and will continue to ask concerning OS/2, let there be no doubt that I believe OS/2, rather than Unix, remains the heavy favourite as DOS's successor. Far more drastic events than anything we've seen so far (and more than minor mis-steps by

Microsoft and IBM) will have to occur for that to change.

In fact, I'm still willing to reaffirm the prediction I made at the beginning of this year: the acceptance of OS/2 will sharply pick up speed before the year is out. With more applications appearing monthly and more users moving to more capable 386 and 486-based systems, OS/2's prospects are likely to improve, perhaps quite dramatically, in the months ahead.



The seminal books on project management and programmer productivity were written nearly 20 years ago. Bill Machrone suggests they're still not outmoded

Any programmer or project manager who's been around the block can tell you about two favourite books: *The Mythical Man Month* (\$34.95), by Frederick Brooks, Jr; and *The Psychology of Computer Programming* (\$59.95), by Gerald Weinberg. The strange thing is that virtually no other books on the subject come to mind, even though these were written in the early 1970s.

Through the '60s and early '70s, there was much discussion about programmer productivity, analysis and design, and task management. Then it all seemed to evaporate, although the problems have worsened. Yourdon and DeMarco have covered some of the ground, but mostly from a methodological standpoint. Has no-one advanced the state-of-the-art of programming and project management?

Or was I remembering these books through the rosy filter of retrospection? To find out, I reread them. I was surprised and pleased to discover that their insights on the nature of programming as human endeavour and its management were as fresh as ever. I also found them quaintly dated, given the utter non-existence or even inkling of PCs.

History aside, I'm prepared to recommend these books to an entire new generation of programmers

and managers. Perhaps if these books had been more widely read, some of the more infamous personal computer software debacles of the past year or two wouldn't have happened. Here's why.

These books sensitise you to the organisational dynamics, human factors and Murphy-like laws that govern software development. Both are rich in aphorisms and rules that will come into your conversations.

Of the two, Brooks is the more required read. He has been called 'the father of the IBM System/360'. In three years' time, over 5000 man years of work went into designing it. We're fortunate that the person charged with creating the quintessential business computer operating system is literate and introspective. His premise is clearly stated in the book title. Brooks wastes no time getting to the heart of the matter; the first chapter proves with examples and charts that merely thinking in terms of man months is an invitation to disaster. The book comes to an inescapable conclusion, now known as Brooks' Law: 'adding manpower to a late software project makes it later'.

Not every task has to be the size of OS/360 for Brooks' book to be useful. He defines the inner workings of the tiger team, the

small group of top performers that can seemingly program rings around far larger departments. He discusses the role of architectural integrity and how to get it; he points out something often seen, but not identified: the Second System Effect. That's where the members of the team are solving the problem at hand or one reasonably similar for the second time. Brooks observes that people tend to store up innovative ideas, features and frills that wind up in the second system. The result is an over-designed, overfeatured product that may perform poorly, yet at the same time be nearly impossible to program. Sound familiar?

His prognosis for maintenance programming is grim: "All repairs tend to destroy the structure, to increase the entropy and disorder of the system. Less and less effort is spent on fixing original design flaws; more and more is spent on fixing flaws introduced by earlier fixes." Part of the trick, says Brooks, is knowing when to give up and start again. *The Mythical Man Month* adds such awareness to your decision-making arsenal.

Weinberg, in *The Psychology of Computer Programming*, has an unending stream of aphorisms and anecdotes that deal with the human factors of programming. Maxims such as 'Any program that works is better

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than any program that doesn't, and 'Every large and significant program has "just one more bug"' set the tone for the book, which takes you on a joyride of failed systems and bruised egos. Seen through Weinberg's perceptive eyes, each tale becomes an object lesson. He amply illustrates the importance of interaction and the obtuseness of management in inadvertently stifling it.

Every chapter ends with questions for managers and programmers; many of these questions could spark

hours of productive office debate, or provide food for quiet reflection at home.

The Psychology of Computer Programming is like three books in one. The first two sections address the individual and organisational factors affecting programming. Like Brooks, Weinberg distills team dynamics down to the essence: 'For the best programming at the least cost, give the best possible programmers you can find sufficient time so you need the smallest number of them'.

The next section of the

book discusses personality factors that make for a good programmer. This was a major issue 20 years ago, when IBM and others sold programmer aptitude tests to companies. These went well beyond the expected problem-solving skills and deeply into personality factors and personality testing. Although personality testing has fallen into disuse of late, Weinberg makes an excellent case. Maybe we should be using the tests before we hire programmers for critical tasks.

In the final chapters,

Weinberg postulates the ideal programming environment and language. Given the date of the book, some of his notions seem naïve, but they were some of the clearest thinking on the subject for its time. Overall, however, he makes some excellent recommendations on approaches to standards. Managers of shops that are hotbeds of individuality and idiosyncrasy would do well to study this chapter and prepare to get tough.

These books continue to stand out for a simple reason: they're still the best.



**All the hype about
Toolbook has our
columnist John
Sterlicci very
curious.**

When Microsoft launched Windows 3.0 in May to kick off a \$13 million promotion of the technology, software publishers from far and wide stampeded to be aligned with the product.

Many announcements were missed in the rush, but one product seemed to stand out and catch the eye of even the most jaded Windows peeper, Toolbook. The package was the first from a company called Asymetrix, which just happens to be owned by Paul Allen, Bill Gates' best buddy and the co-founder and former president of Microsoft.

Toolbook resembles Apple's HyperCard and will bring to the Windows environment a software construction kit previously available only on Macintosh computers.

Toolbook 1.0 allows users to tailor their programs via Object Oriented Programming (OOP), creating new ways of manoeuvring through data, still pictures or even video footage. Through the \$595 Toolbook, users with varying skills are offered high-level development capabilities.

Asymetrix was founded in 1985 by Allen, with a rather sickly corporate mission to develop software that 'works more like people do'.

The company is privately held, employee-owned and has derived all of its funding

— an undisclosed amount — straight from 37-year-old Allen's deep pockets.

Everybody at Asymetrix owns stock although Allen owns the majority. For a man who owns 18 per cent of Microsoft and is worth US\$1.4 billion, launching Asymetrix was probably no big deal. I would have liked to ask Allen himself, but a Trappist monk is easier to interview. Allen came down with Hodgkins Disease in 1982 and then left Microsoft in 1983, where at the time he was vice president of R&D.

Since, he has shirked interviews although his money has spoken volumes. Besides starting Asymetrix, he shelled out millions to buy one of the top two basketball teams in the US, the Portland Trail Blazers, as well as a much publicised \$900,000 sports car, which the US Customs won't let him bring into the country.

Insiders at Asymetrix tell me the phones have been ringing constantly since the May 21 announcement, with people asking where they can purchase the product.

"It's one of the most important products for the PC to come along in years," said Tim Bajarin, an analyst with Creative Strategies here in Silicon Valley and occasional APC columnist, where the product has undergone months of beta test-

ing. He added: "Hypertext and scripting adds more flexibility to PCs. It's a very rich customising solution."

While the product itself is something to boast about, the man behind it is certainly responsible for much of the hoopla over Toolbook due to his association with Microsoft. By the way, he has just rejoined the board there, as it seems he's the only person Bill Gates ever listens to.

The company admitted that some of the excitement level over Toolbook is due to the company's founder.

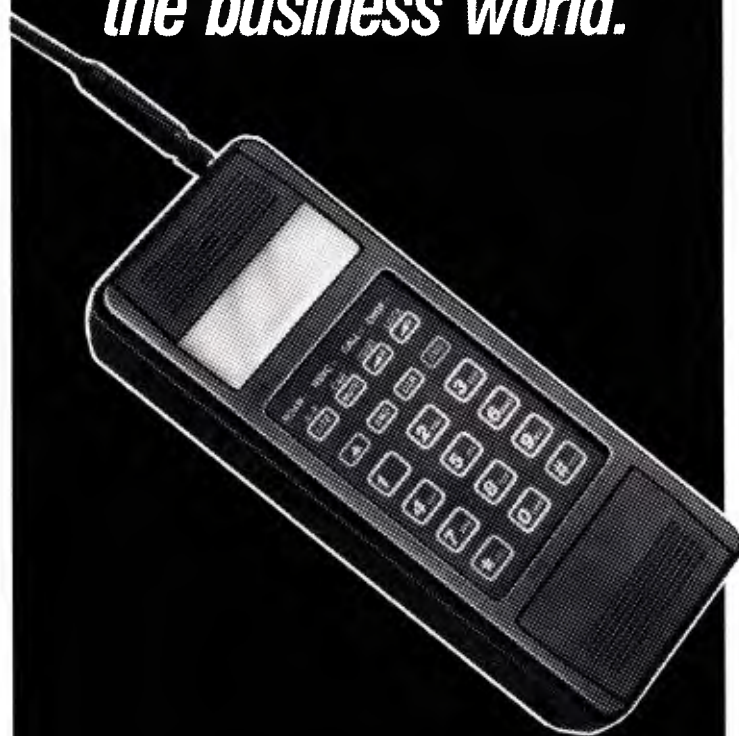
"People want to know what Paul has been doing for the past five years," said Asymetrix mouthpiece Steve Wood.

"He's a low-key guy," explained Pam Miller, the head of public relations for Asymetrix.

Starting with six people, Asymetrix's first efforts were in researching artificial intelligence, object-oriented programming and graphical user interfaces. Today Asymetrix has grown to a workforce of 70-75 and has plans of expanding rapidly over the next year.

The Toolbook product is part of a growing trend toward allowing users to take advantage of personal applications, created by and for end-users with little or no programming experience. Through Asymetrix's software con-

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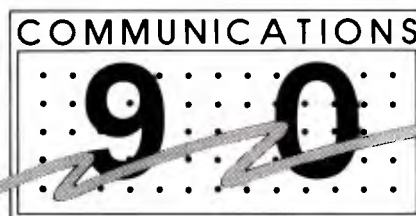
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struction kit, the user achieves this feat via an object-oriented programming environment that consists of elements of fourth-generation languages. Therefore, Toolbook's interface is geared for the PC end-user and not sophisticated programmers.

Toolbook is comprised of applications containing one or more 'books' filled with multiple 'pages' which in turn contain various 'objects'. Objects are fields (or text), graphics, or buttons (which perform various actions) that allow scripts to be tied to them. In this way, the product mimics HyperCard's use of card stacks.

The product goes on to

provide the user with a variety of fields, such as a record field, filled with information on each page. Scripts can be tied together via 'hot words' that allow the user to skip between pages containing different bits of information.

Toolbook can be used in two ways, either as a reader or as an author. The author creates books and pages, and the reader is responsible for using any applications created.

The user can create graphics as well from drawing tools provided by the program, or by importing them from paint programs or from a clip-art library that is also included in Toolbook.

Another handy feature of Toolbook is its English-like Open Script language in which the user can create any level of animation by capturing actions performed on any object. This is another feature familiar to users of HyperScript.

But, despite the fact that the Toolbook product is similar to HyperCard, word is that it improves upon Apple's product by using colour instead of black and white, and by allowing animation to be created quickly by recording a series of movements on the screen and writing them automatically in the programming 'script' instructions.

The company says there's nothing out there like it. "It's like HyperCard . . . but different. ToolBook has more depth and it's more powerful," Wood said. Adding that it has more functions, can create and manipulate more objects, has a scripting language, and has more constructs available.

All indications are that at a basic level, Toolbook is a very impressive product. Asymetrix seems to have overcome enormous limitations in the MS-DOS world in obtaining a graphical look, such as the memory barrier.

(Refer to *First Looks for a review of Toolbook* — Ed.)

Live from Hollywood, David Strom delivers a new episode of 'As the LAN turns'.

I noticed an item in my local (US) paper last week about a Hollywood starlet who uses her PC and modem to manage her \$50,000 stock portfolio. Signs of the times: everyone is getting connected.

What will happen in a few years when popular culture catches on to networking? Here are a few trends to favour for.

Coke took a beating on its MagiCan promotion — you know, where actual \$10 bills pop out of specially made cans of soda?

I think PC systems vendors should pick up on this idea and run with it. Imagine assembling your new 486 machine and seeing money pop out of the floppy-disk drive the first time you booted up.

Of course, us journos won't be idle spectators to this phenomenon. We'd be busy developing benchmarks to determine how fast MCA and EISA machines really deliver the bucks. And Cheryl Currid could once again chime in with 'No bucks, no Buck Rogers', and really mean it.

How about the next segment of Oprah: 'Men who love modems too much and the women who leave them'.

Various couples will represent the usual range of is-

sues that her show highlights, such as Hayes compatibility, different protocols and speed matchups.

We could even recommend Dave Methvin as a guest star. He would claim that V.32 modems improve domestic tranquility because they decrease connect time, among other benefits.

And, of course, there's my favourite: 'OS/2: The mini-series', coming soon to your local network. Starring Wendy Redmond, from the Microsoft Windows promotional video, in her first made-for-TV role. With

simultaneous translation in C by Charles Petzold. Special manuals will be available for primary-school teachers documenting the 1000 API calls of Presentation Manager.

This just in: I've heard that the show has been cancelled till next season, due to lack of advertising support and late product deliveries.

Rumour has it, however, that the mini-series is actually the first of three separate shows. The network is already filming parts two and three, which have working titles of 'OS/2 LAN Manager: The Return of the Jedi' and 'SQL Server: The Last Frontier'.

How about Ray Noorda and Jim Manzi in special cameo appearances on next

season's 'Twin Peaks'. Jim will play Laura Palmer's long-lost rich cousin, while Ray will take a turn as the FBI district manager.

The show will finally give insight as to what really happened to that Lotus-Novell merger. Then no one will care anymore who killed Laura.

Everyone has been waiting for the Dick Tracy movie. What they don't realise is that Tracy's famous walkie-talkie wristwatch is actually a wireless LAN terminal.

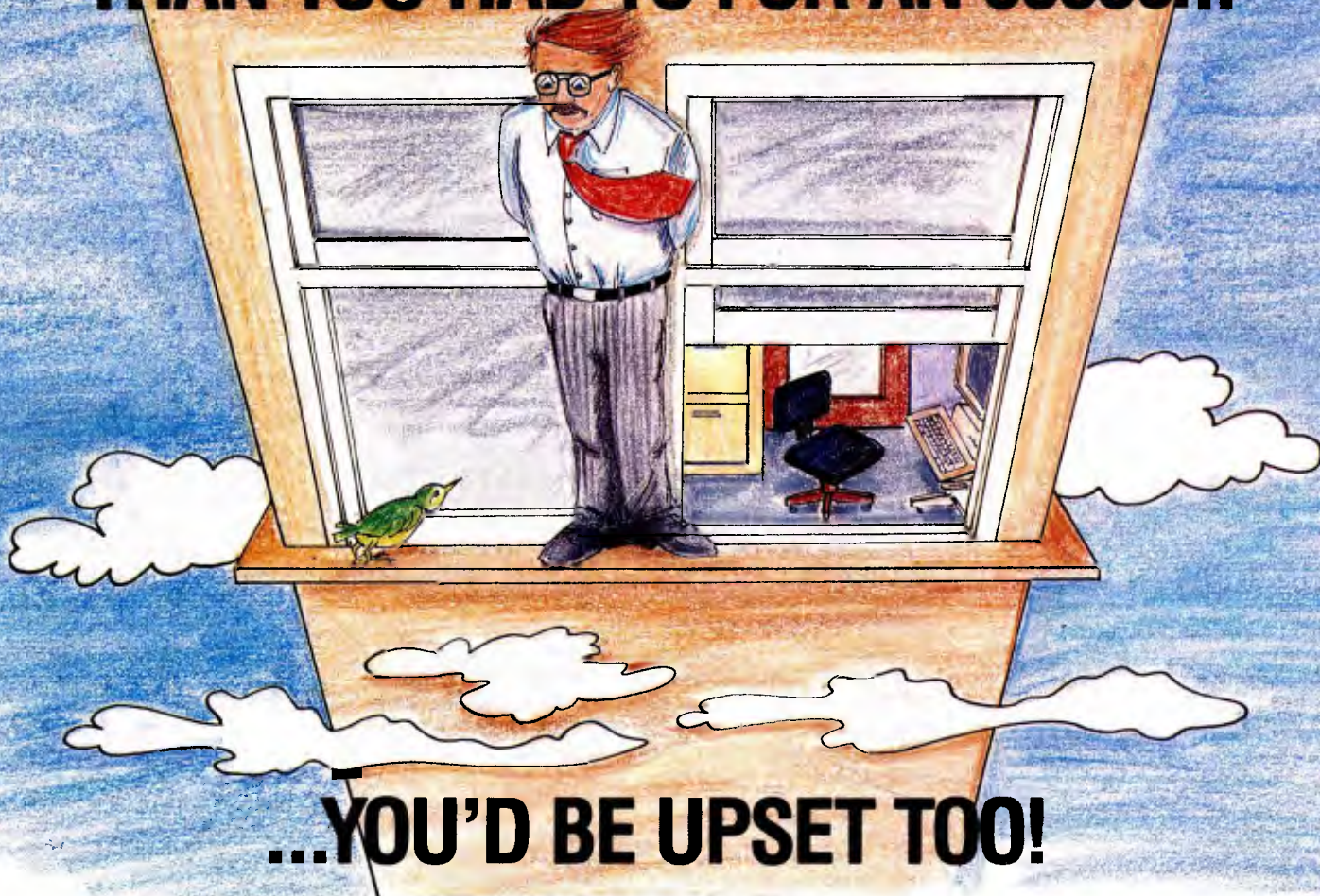
Tracy runs into trouble when he needs a new version of his E-mail software and three PROM upgrades for his watch. If he doesn't upgrade, the bad guys could tap into his conversations.

What I've really been looking forward to is a LAN segment on talk-back radio, hosted by a couple of nerds who will take listeners' calls over the air about networking problems.

Predictably, they'll give their usual pithy quips rather than any real or useful information. You know, something like: 'Should I go with Ethernet over twisted-pair?' 'Twisted pair? Why double your troubles? Stick with coax. Heh, heh'.

Maybe I should apply for a guest spot.

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What's the magic about Win 3? Paul Somerson explains that it is all in the eighth-of-an-inch.

It's not easy being red. According to Microsoft chairman Bill Gates, who has awfully good information sources, the PC universe consists of 40 million 'blue' systems (the nickname refers to the colour of IBM's ubiquitous logo) and three million Apple-red Macs. Although the overall Mac market is disproportionately healthy — accounting for about 10 per cent of all hardware but 20 per cent of all software sales, and growing at a faster clip than the IBM side — these days Apple advocates need to have the patience of Job(s).

Everyone reading this column is fluent in the gospel of Macintosh-interface superiority. Proper training and support are obscenely more expensive on DOS machines. Mac users are far more productive than their IBM counterparts and use far more software packages each. (*Sounds like "I'm trying to figure out which computer is most powerful"?* — Ed.) The absence of numbing DOS command-line complexity and non-standardisation frees Mac users to be much more creative, and the Mac's obvious graphics and audio superiority amplifies the expression of this creativity.

Unfortunately, some buyers are still hypnotised by the flea-market-sale prices of a good many IBM clones. They confuse the price of the machine with the cost of running it. And while an entry-level Mac could help level the playing field a bit, bargain-basement DOS boxes will always carry substantially lower price tags.

This is yet another example of the old quality-versus-quantity problem that's been hamstringing the industry for years. Trying to halt the IBM momentum with a low-priced Mac is about as futile as trying to stop a tank with a rifle, even if you happen to be using the absolutely best-made rifle in the world.

Funny thing is that,

under the skin, Macs and PS/2s are nearly identical. Try this: take a Ilci and a PS/2 Model 50, pop off the lids, and invite a group of users to peer down into both and tell you which is which. Both systems are fairly advanced technological gems filled with surface-mounted chips and manufactured by two of the best hardware-design companies out there. Each has about the same footprint as the other, and each contains the same basic parts — similar power supplies, 32-bit slots, drive bays, ports.

The big difference is, of course, what's on the ROM chips. IBM's contain a modest set of routines that still pretty much make the system operate like a primitive Teletype machine. Apple's are packed with sophisticated window-oriented graphics tools. The Apple advantage is obvious from the moment you turn each system on. And it becomes even clearer when you do normal housekeeping, such as setting up on-disk storage areas or moving and deleting files.

Or does it?

All of a sudden, the gloom-and-doom merchants are pointing to another cloud on Apple's horizon. And this time, they argue, it's not just another squall; it's the Big One: Windows 3 (a.k.a. Win 3).

What makes this new Win in old bottles so fearsome?

Is it an awesome set of abilities? Is it an honest-to-goodness Mac-like interface? Is it unfettered power or unrivalled smoothness or intelligence? Guess again.

Much of the hand-writing is the result of a widely published photograph in which Marc Canter, chairman and founder of MacroMind, and Reese Jones, president of Farallon, are seen posing stiffly with Microsoft's Bill Gates.

Mac doomsters rank this photo right up there with the one of Stalin and Truman. How . . . could they! Here are two of the all-

time archetypal Mac-forever DOS-haters actually sitting down and schmoozing with the enemy!

It gets worse. I button-holed Marc recently and asked whether this was an aggressive strategic move, a protect-your-backside insurance policy, or a sign from heaven that John Sculley had better dust off the old résumé. Here's what he said:

"Apple ought to fire 9000 more employees and get totally out of the hardware business and then concentrate on just being the best damn software company in the world."

When you read that, did beads of sweat start pooling in places where the sun doesn't shine? If they did, towel down and stop worrying.

I have to admit, Marc's Apple blasphemy made me a bit apprehensive at first. So I got in touch with The DOS Guru, the brilliant, eponymous head of a wildly successful utilities-software company who knows more about DOS and Windows than Microsoft.

I asked him point-blank: "What's the magic about Win 3?"

"Easy answer," he fired back. "It's the eighth-of-an-inch difference."

How true. How accurate. How perfectly Zen-like.

The reason so many people are falling over each other to embrace Win 3 is that it has NeXT-like screens whose little eighth-of-an-inch shadows make them look sort of three-dimensional. And colour icons.

Stop the presses.

Is it seamless and well thought out and wonderfully integrated like the Mac? Well, no, but those scroll bars actually look like they're sticking up off the screen! Can you figure out how to work intuitively through any operation, or run any application without a manual the way you can with a Mac? No, but how about those colour icons? Aren't they gorgeous!

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just DOS with a facelift, a nose job, and some long-overdue liposuction. Stick a raw disk into a PC running Win 3 and the system grinds confusingly to a halt. Insert the same disk into a Mac, and it understands. Hmm. This disk isn't initialised. Want me to do it for you? And verify the formatting operation automatically?

Big difference. Another big difference is performance. The Mac is designed as a graphics machine. DOS

is a text-based system. Windows runs on top of DOS. It's an extra layer of overhead. An extra slow layer. Apple likes to show off by running the same Excel macro on a 16MHz Mac (not a IIcx, mind you, not even a IIci) and a 33MHz Compaq 386 system running Windows. The Mac blows Windows and the theoretically faster DOS machine out the window.

But the sceptics persist. "Mac companies such as MacroMind are spending

their resources on DOS systems instead of dedicating their efforts to widening the Mac lead."

This reminds me of the story about people who have ants in their kitchen and decide to get rid of them by spreading a trail of sugar from the ant infestation out the door, hoping to lure them outside. What they end up with is more ants.

There are 50,000 DOS software packages out there, and 5000 Mac packages. It's

true that vendors will soon be able to write one icon-based, window-aware engine and port it equally easily to DOS and Mac (and Unix) systems. But who is this going to help most? If half the vendors on each side of the red/blue divide suddenly start taking advantage of this ability, 2500 Mac apps will suddenly run on DOS machines. But 25,000 DOS packages will just as suddenly work on Macintosh software.

I can't wait.



William Zachman counters Paul Somerson's view of Windows 3 with a report on its game score to-date.

Based on early returns, it looks like Windows 3.0 will be a smashing success. The new version is not only the hottest product around, it has been winning converts from the ranks of those who clearly never expected to be running Microsoft Windows on their PCs.

It's true, not everything has gone smoothly for everyone. Lots of people have encountered some initial problems in getting Windows 3.0 up and running on their systems. Most, however, have been able to solve them.

In some cases, more serious problems remain. The worst so far appears to be a possible irretrievable corruption of disks using Ontrack Systems' DMDVR.

Drivers aren't available for various input and output devices. A few more-or-less random examples include Summagraphics' SummaSketch tablet (they're working on it), Panasonic printers and IBM's own abandoned child, the Quietwriter II. In addition, Windows 3.0 won't run in 386 enhanced mode with the Intel AboveBoard 386.

Despite such glitches, however, the majority of early users have had few or no problems getting Windows 3.0 up and running. More importantly, their reactions to it are generally very positive and, in many cases, downright enthusiastic.

An amazingly large num-

ber of those who only a few months ago spoke disparagingly of 'goosey' interfaces and proclaimed their undying loyalty to one of the character-mode DOS multitaskers, are jumping on board the Windows 3.0 bandwagon. Many who were convinced that their character-mode spreadsheets and word processors would satisfy them forever are now looking at GUI alternatives.

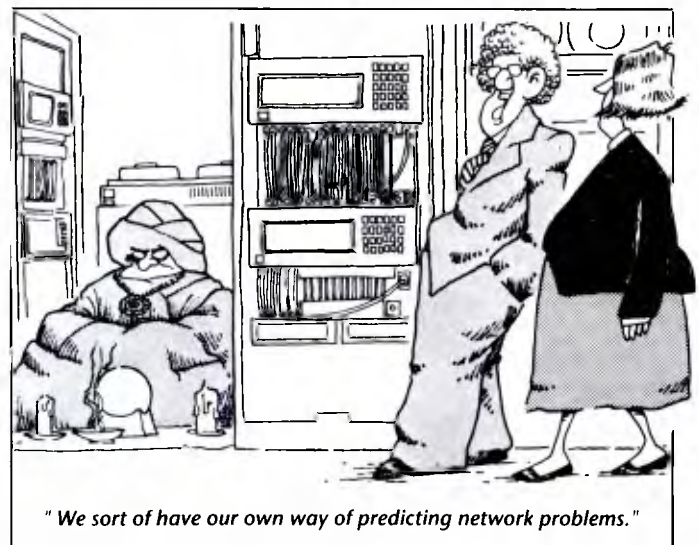
Relative to reasonable expectations, Microsoft has done a remarkable job in providing impressive functionality with Windows 3.0 across a very wide range of hardware and software. The result — again relative to reasonable expectations — is that Windows 3.0 is well on its way to being a smashing success.

This means that the

remaining problems, to the extent that they're solvable (and most are), will be solved. Unlike earlier versions of Windows, which never reached critical mass, version 3.0 is clearly passing over the threshold of acceptance that will make it necessary for hardware and software vendors to respond by ensuring that their products work with it.

Hardware vendors can no longer afford to ignore the need to provide Windows drivers for their products. And software vendors can no longer afford to ignore Windows, either. The result will be not only a scramble by third-party vendors to provide the missing pieces in Windows support, but also a growing awareness that they can't afford to ignore OS/2 support as well.

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Microsoft's 'customer service'

Fellow sufferer Lawrie Debnam's story (APC May 1990) struck a chord with me. My experience with Microsoft is just as atrocious, and my opinion about grey marketing is: do it!

I have been using Word (PC) for some years now. The program is fine, although there are hitches, but the arrogance of the company is astonishing. Still with version 4, when I switched between two printer drivers, two of my paragraph styles were also switched around in my documents. I first tried to ring Microsoft's Hotline towards the end of 1988. Doing this from Armidale is an expensive exercise, as one is put on hold for ages. It also proved quite pointless, since their expert could not crack the problem. We agreed amicably that I should send them a detailed account documenting the problem. Within a week I did, complete with everything on a disk, and I have not received a reply since. I sent an enquiry on 26 May 1989, copied to HQ in the US: no reaction.

When I bought version 5, I was hoping that the problem would be ironed out. It was not, and there was a new bug: my previous macros that used non-alphabetical keys (ie, commas and parentheses) did not work any longer. I went through the whole rigmarole of documenting everything and putting illustrations on disk again. I also asked for the supplemental printer disk that they offer in the manual. I sent it, certified, on 10 January 1990, and have the return receipt to prove that they received it on 12 January. You guessed it: no acknowledgement, no response, no supplemental printer disk. The only thing I got from Microsoft was junk mail, inviting me to pay for the privilege of joining their damn software club; presumably they only talk to people who shell out the

money. Their records people managed to scramble up my name though; I am surprised that the offer reached me at all.

Now, I haven't had the need yet to approach the Australian representatives of other big software companies, so I can only testify that Microsoft's 'customer service' is ripe for an investigation by Consumer Affairs and the Prices Surveillance Authority.

Peter Norton's local reps were a bit uncertain of themselves when I had some trouble with Speed Disk, but the 'fixed-up' version did arrive without much delay. And when I encountered a 'bug, please report' message generated by Lahey's Fortran compiler (much better than Microsoft's and, at any rate, I am now avoiding Microsoft products), I duly sent a report to the US by mail, as nothing seemed to be wrong to me.

The very thorough and professional response came, upon receipt, in the form of a two-page telex.

George Antony
Dept. of Agricultural Economics and Business Management
University of New England

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should be in your mailbox any day now.

Format failure with Norton Utilities

I recently bought two new boxes of disks: one box of Computer Accessories' double sided double density 3.5in disks and one box of CIS Double Sided High Density 5.25in disks. While formatting these disks with Norton's Safe Format (Advanced Edition version 4.5) I came across a small problem: in the box of CIS disks there was one disk that my computer would not recognise and in the box of Computer Accessories disks there were three such disks.

Part one of my problem was that Norton's Safe Format would not recognise these four disks — it just kept asking me to put a disk in the drive (and I did indeed have a disk in the drive). Finding this somewhat odd I rang the Norton Disk Doctor, who gave me the same response. Fed up with that I went to the Norton Utilities themselves and in /m mode they gave me the same message. At this stage, I thought I must have a dud set of disks, but decided to attempt the DOS 4.0 format — it worked on two of the four disks and indicated that the media descriptor was bad on the other two. I proceeded then to debug, attempting, with little success, to write to the media descriptor byte of the disk (debug just gave me the 'General failure writing to drive B' message).

Getting to the point, I would like to know why Norton Utilities did not recognise the two disks that DOS formatted quite happily and without a problem? Have you come across such a problem before, and if so is it fixable?

Christian Abel

Norton's Safe Format (SF) program first tries to read a disk to ascertain whether it has already been formatted. If it has it then offers the user several

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options, one of which is to terminate the process.

If the disk is not recognisable as a DOS disk, Safe Format will attempt to format the first track. Having done this, it then checks the quality of the disk surface by writing a series of test bytes to the entire track. The test bytes are read and then re-written in a different format, flipping all of the bits to the opposite state. The first write might be 01010101 and the second write 10101010. This is often referred to as a 'worm' or 'wriggle' test.

If the track passes this test, the next track is processed until the format is complete. As with all format programs, SF writes the 'boot' sector information to sector one, track zero, side zero. The boot record or sector is written to all formatted disks whether they are to be bootable system disks or not.

DOS on the other hand does no such wriggle test. It

dives headfirst into the formatting procedure, then reads the track to check it is as it was written. Providing the information is still there the next time around, DOS assumes the disk to be good and continues. If a bad sector is found it is re-tried, usually five times. If it is still found to be bad, it is mapped out in the File Allocation Table (FAT) which FORMAT builds in memory. As mentioned previously, this is then written to track zero at the completion of the format.

The response you received from debug trying to write the media byte was because the disk was still unformatted. The media byte and the boot sector are written last to the disk enabling the FAT with its mapped out sectors to be written at the same time. The same reason also holds true for the response from Norton's Utilities in the maintenance mode (/m).

An interesting point to note

is that Norton's Disk Doctor (NDD) will declare some sectors on a formatted disk as bad which have been passed by DOS's FORMAT due to NDD's more stringent testing of the disk surface. In my opinion, the more stringent

the test the better. I would rather know about a faulty sector at the time of formatting than when I am desperate for the information no longer retrievable from a faulty sector — PN.

END



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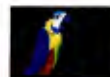
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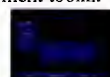
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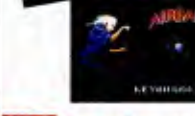
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Sharp PC-6220

Small, light, powerful and with a magnificent VGA screen, Sharp's PC-6220 looks the most promising laptop yet. Ian Davies delivers his findings.

Portable computers have been looking good on whiteboards for close to 20 years now. In the beginning, the 'luggables' saved us all the trouble of hauling around separate keyboards, system units and monitors. Instead, we could carry the whole heaving mess in one convenient, if weighty, package. Luggables were fine in their day, did very nicely for Compaq, and still have their places.

Then there were the pocket computers. These things had a few dozen kilobytes of memory and usually ran interpretive Basic. Often they could save data on tape and had a couple of applications burnt into ROMs. They were very similar to the desktop computers we used to use.

With the world turning MS-DOS, these 'incompatible' little gadgets started to become less appealing. Of course, you could transfer data to and from the desktop using a serial cable, but this meant learning two machines, and software couldn't be ported between them.

After the MS-DOS luggables came the true MS-DOS portable. These things usually came in a 'clam shell' configuration and featured 640K and one or two 3.5in floppy disk drives. Some even had room for a couple of standard expansion cards. They were big and heavy, but they ran off batteries for several hours and could be used on the go.

The problem was, of course, the lack of a hard disk. While 1.44M of disk storage used to be considered prodigious, by the time these things arrived, it wasn't large enough to run what we were all running on our desktops.

The obvious answer was to include a hard disk, which a number of manufacturers did. In fact, they even added a power cable. It wasn't that they thought





users really wanted power cables — they just couldn't get decent running time out of a continually rotating hard disk without massive batteries.

The whole process was one of laptops chasing equality of power and functionality with desktop systems. The only way they could come close was to compromise portability — which, for a laptop, isn't a viable solution.

Finally, last year, the laptops caught up. A combination of technologies made this possible: large, crisp LCDs; small start-stop hard disk drives; low power chips; and high capacity batteries. The end result is that you can now carry around a computer that is all but the equal of a desktop system. Moreover, the laptop system runs on batteries, doesn't weigh a tonne and is small enough to slip inside a brief case with room left over. The remaining inequality lies in colour (but not for long), expansion capability (comes with the territory) and price.

A Sharp entry

The Sharp PC-6220 is a recent entry to this market, and benefits from not being the first.

It's a notebook sized computer with 1M of RAM, 20M hard disk, 12MHz 80C286 processor, VGA display adaptor and the best LCD screen I've ever seen. All this in a 2kg battery-powered package.

It's my belief however, that the notebook appellation is still pushing things a bit. It is true that you can buy notebooks of approximately these dimensions and that those who do usually employ them as desktop notebooks — ledgers and the like. But, rarely would they carry them around unless they planned on taking a lot of notes. So, yes, it is a portable computer the same size as a notebook. But, it is a desktop notebook and definitely not a portable notebook.

It really is amazing how much power and functionality is stuffed into this diminutive package. As I remarked last time I reviewed one of these things, laptops have turned the corner. For the first time, they have a truly useful degree of functionality in a practical-sized package.

The PC-6220 is presented in a 27.9 by 21.6 by 3.4cm case with a flip-top lid. The screen occupies just about the whole of the inside lid and the keyboard about two thirds of the lower panel. The LCD technology used is called Triple Super-Twist, which sounds more like marketing hype than serious technology, but it works a treat. Unlike early LCD attempts that had a very narrow cone of visibility, this device remains clearly visible well past 45 degrees off-centre. There is no need to hold your head carefully in the

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middle of the cone of visibility, you can put your head where you like and adjust the screen angle as you choose. Even small groups of people can all see the screen at the same time. It's great.

The screen is a VGA compatible system. This is also quite an advance, as many laptops provide only text or CGA compatible displays. More and more laptops will provide VGA in the future as it becomes a minimum reasonable graphics platform. Further, the PC-6220 performs grey-scaling across 16 shades. That's impressive for a laptop, and in theory should mean that software can be run using its standard colour palettes. In practice, adjacent shades are so similar that they may still be hard to distinguish, and so many users will want or need to reconfigure application colour schemes or shift to a monochrome colour scheme.

The PC-6220 can be plugged into an external monitor, though this requires an optional adaptor. Initially, I found this obligation a little disappointing, but upon reflection, it's smart. Many users will never need to use an external monitor, so Sharp is reducing cost, weight and size. The adaptor is installed internally in a small option bay that can alternatively accept a modem.

The display is paper-white by default, which seems to improve the readability of the LCD. A switch is provided near the contrast and brightness controls to resume normal display conventions, if required. Some graphics and many games look a little strange with black and white reversed.

The keyboard is a masterpiece of space efficiency. It's small — smaller than the QWERTY area on a normal board — but not cramped. Some early laptops featured warped keyboard schemes that bore little resemblance to normality. I found that I could move from a 101 key board to the PC-6220 with virtually no alteration of typing style. Typing within the QWERTY area does not seem cramped to any degree because Sharp spread the 'QWERTY' section as much as possible, and the keys are the same size as on a full keyboard. The shift, enter, tab, caps lock and backspace keys are enlarged as on a normal board, and are also in the usual position. The function keys are reduced in size and run across the top. This presents no problems as you only have to press function keys — you don't type on them. A small cursor pad diamond is tucked at the right hand size.

A numeric pad is overlaid on the ASCII keys, accessed through a special key labelled Fn. In practice, I doubt anyone would use the numeric pad as the numbers running across the top of the QWERTY work well and an external numeric pad is available. The blue Fn button is



The PC-6220's keyboard is a long way from those of earlier laptops. With the exception of an awkward PgDn key combination, there's little to grumble about

used to access those keys that Sharp thought could be piggy backed on another key. F11 and F12, for example, double up on F1 and F2.

The keyboard feels great and is really stable. My only criticism is that the Home, End, PgUp and PgDn keys have been piggy backed on the cursor diamond, and hence require the use of the blue Fn key. This is a drag as people tend to press PgUp and PgDn a great deal, and having to use a combination of two keys is tedious. To press control PgUp, you need to use three keys. The funny thing is, Sharp did have some additional real estate they could have redeployed. The board models the standard 101 key layout so faithfully that it has Ctrl and Alt keys on each side of the space bar — about seven and a half centimetres apart. I think they could have dropped the extra set and gone for dedicated PgUp and PgDn keys at least, and maybe Home and End as well.

Having said that, I should note that normally laptop keyboards are a mess. If these few comments are the extent of the criticism, I think Sharp has done wonderfully well.

Going walkabout

Perhaps the most controversial feature of the PC-6220 is the lack of a standard carrying case or handle. Some people get really emotional about this, but I'm not so sure. I think it's preferable that the computer itself is built to travel, rather than having to be bundled in a protective cocoon. The PC-6220 features a robust finish that looks happy to hit the road. A carry case is available as an option. As far

as the handle goes, well, do people criticise books for not having handles? Rarely!

The weight of 2kg is partially achieved through the use of advanced battery technology. The battery runs across the front of the unit and is about 1.5cm square in profile. It provides roughly two hours running time, taking a little over two hours to recharge.

Battery life is determined by many factors, including the screen brightness and CPU speed. Although screen brightness is quite a credible factor, Sharp's recommendation of dropping the CPU back to 6MHz for non-compute intensive applications seems a little far fetched. Probably the major battery consideration is hard disk usage.

The hard disk spins down after 15 seconds, resulting in a slight lag when it is next accessed. This gives the illusion that the system is slower than it is, but is essential for power minimisation purposes. For most word processing and spreadsheet applications, hard disk usage is only occasional anyway.

The display blanks out after one minute of inactivity and the whole system goes into stand-by mode after five minutes. However, all of these parameters can be altered through a utility, and the system can be manually thrown into stand-by mode through the use of a key combination when required.

It may seem tiresome to have to worry about these things, but with only two hours of battery life, a few economy measures can make all the difference. Simply hitting Fn-Pause when the phone rings or the customer talks is a minor habit to acquire. Regardless, two hours

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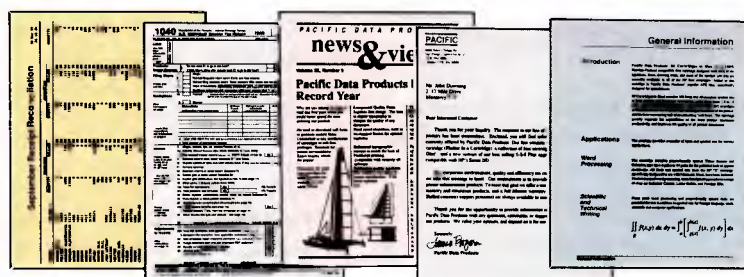
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The expansion bus consumes a large part of the PC-6220's rear end

worth of computing should be sufficient for many daily mobile applications.

The PC-6220 may have its case closed when the power is on, although it will warn you by beeping for 30 seconds afterwards. This is a well-thought feature, considering how easy it is to close the case thinking the computer has been turned off when in reality it is only in stand-by mode. The warning can be disabled.

Small LEDs indicate battery status, showing when more than 90 per cent of charge is loaded and when only 10 per cent remains. A warning LED starts to flash when power gets really low, and in its last gasps the system will provide an audio alert. I don't know what it does if it detects incoming nuclear missiles.

Inside

For a computer of its size, the PC-6220 is no slouch when it comes to features. The 80C286 CPU runs at 12MHz and can be run at lower speeds when required. Memory of 1M is supplied as standard, which allows 640K of conventional memory as well as a small amount of extended or expanded. This can be upgraded to 3M — internally!

The CPU used is a CMOS version of the 80286 made by Harris. Intel licensed the design to Harris, and the chip even bears an Intel copyright message, so there is no need to worry about compatibility problems. CMOS chips use only a fraction of the power of normal chips and Intel do not make CMOS 80286s.

Sharp has included a socket for an 80287 numeric co-processor. I think the designers could have saved the board real estate or employed it more usefully. The socket takes up a very large percentage of the total board space, and I suspect few users will ever install the chip. Looking at what else Sharp has been able to achieve in such a small area, it's a pity to think of all that board space going to waste.

The PC-6220 includes a parallel and serial port as standard. The serial port is a standard 9-pin plug accessed from behind a small flap. The parallel port has a micro miniature connector hidden behind a panel. Sharp includes a small plug adaptor for standard IBM 25-pin Centronics printer cables. The adaptor is small enough to fit in a top pocket allowing you to easily take it with you whenever you need it.

Disking it

Disk storage is provided through a 20M 2.5in hard disk drive with an average access time of 23ms. The disk spins down after a timeout interval of non-use, initially set to 15 seconds, and only takes a moment to spin up again.

•These laptops aren't cheap. For that sort of money, you could buy a ferocious 386 with all the trimmings, but you couldn't take it with you.

With all these goodies packed in, you might think there must be something Sharp left out, and indeed there is — a floppy disk. On the face of it, the lack of a floppy sounds pretty serious — enough to make one look elsewhere. But in fact, some clever packing makes it all work out.

A floppy takes up a great deal of space and weight and is only rarely used, so removing the floppy makes good sense. The problem is, how does one get things into the machine? The operating system, for instance . . .

The PC-6220 has what Sharp refers to as a ROM Disk. This is a 1M ROM chip which emulates a DOS disk volume. When the machine is first turned on, the ROM disk appears as drive C, and the 20M disk appears as D. The ROM disk is bootable and contains MS-DOS 4.01. DOS is installed from drive C to D, and the machine then reconfigures itself with the 20M as C. The ROM disk is invisible and equivalent to a normal bootable system disk.

Also bundled with the machine is Traveling Software's LapLink. This is a remote access program like Brooklyn Bridge and allows files to be transferred between two PCs via a serial cable. The serial cable is included with the PC-6220 and has connections for both 9-pin and 25-pin serial ports at the other end. To transfer software from your desktop to the PC-6220, you simply insert the serial cable and run LapLink on each machine. LapLink is present on the ROM disk, making it impossible to lose.

So far so good, but how do you run LapLink on the desktop system if the only copy resides on the Sharp's ROM disk? Simple! The first thing LapLink does is install itself on the remote system; making it necessary to only type in two standard DOS commands to get it going. For those occasions where you really need a floppy drive, for example, running tricky software installations, a LapLink module called DD allows the PC-6220 to use the disk drives and printers on the desktop computer as though they were its own.

It may seem radical not to provide a floppy disk drive, but Sharp appears to have thought it all out and its proposed solutions should work fine. And if you *really* need a floppy drive, you can always buy the expansion unit. My only concern is that without a floppy, individual tenderfoots may be even less inclined to back up than under normal circumstances.

Sharp makes some pretty interesting recommendations for treatment of the hard disk. First, it is recommended that the machine not be moved when the disk is in use. That seems a little incongruous for a laptop, but is fair warning. In practice, you can probably get away with it — people move desktop machines when they are on. Further, it's more than likely that the disk will be stopped while your moving anyway, which makes it safer to move the PC-6220 than a desktop.

The other warning Sharp makes regards temperature. The engineers suggest that the machine avoid being subject to temperature differentials of more than 10 degrees. If you need to, for example, take it from inside the Arlberg



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RANK XEROX

Technical specifications

Sharp PC-6220

Distributor:	Sharp
Telephone:	(02) 831 9111
Price:	\$5950
Processor:	Harris 80C286, 12MHz
RAM fitted:	1M
Maximum internal RAM:	3M
Hard Disk:	20M 2.5in, 23ms access time
Floppies:	None — access through LapLink
Video:	VGA
Display:	Triple Supertwist backlit LCD, 16 shades of grey
Keyboard:	80 keys, 101-key compatible
Ports:	Serial, parallel, expansion, numeric pad
Operating System:	MS-DOS 4.01
Bundled Software:	LapLink
Battery life:	Two hours
Dimensions:	27.9 x 21.6 x 3.4cms
Weight:	2kg
Options:	Numeric pad, monitor adaptor, floppy disk, expansion unit, carry case, battery extension, 80287 numeric co-processor

at Mt Buller onto the snow, they recommend that you should take it via a series of other places that are no more than 10 degrees colder than the place before, leaving it for an hour in each place. I thought only TRS-80 disk drives were like that! One assumes that this is one of those manufacturer's recommendations that can be ignored with only minor risk of cataclysm.

Options

As mentioned, internal expansion options include an additional 2M of RAM, a co-processor and an external CRT adaptor.

External options include a battery pack which increases life to five hours and a 3.5in floppy disk drive. The drive includes a port for the connection of a 5.25in drive and a socket into which a full size keyboard may be plugged. A numeric keypad can be slotted onto the side of the system for number intensive applications. An expansion unit can be attached to the rear of the PC-6220 allowing one full size and one half size standard PC expansion card to be fitted.

In practice, the expansion unit would not be fitted to the PC-6220 for every day use as it turns the machine into a large, heavy clunker. But the expansion unit does make a good desktop receiving station for the PC-6220. The provision of expansion slots makes it more so, this being where you install your LAN adaptor card. Sharp has finally addressed the issue of how you get your laptop onto the LAN! Just stroll into the office, fling the felt fedora at the hat rack, slot the PC-

6220 into the expansion unit and log onto the LAN. Easy.

Sharp may also provide, as an option, an internal modem (with the possibility of fax capability). Full details were not available at the time of writing.

Conclusion

I like the PC-6220. I'd like a PC-6220. All I've have to do is find a need for one, and \$5950.

These laptops aren't cheap. For that sort of money, you could buy a ferocious 386 with all the trimmings, but you couldn't take it with you. Laptops will never be as cheap as desktop systems —

Benchmarks

Sharp PC-6220

CPU:	5.8
Memory:	10.3
Disk:	2.0
Video:	4.8
Performance index:	4.9

you pay a premium for portability. But at least now, the value for money ratio looks reasonable.

Sharp has obviously put a great deal of design thought into the PC-6220, and it shows. It did more than just build a small computer, it really thought carefully about usability issues. The screen, the keyboard, the on-board expandability and the packaging are brilliant.

The lack of a floppy disk drive is innovative, courageous and ultimately practical. People really don't need floppy drives in laptops all the time — it just took Sharp to think of it and provide a solution. The only possible caveat would exist where a PC-6220 user had no access to a floppy-equipped PC. This, as Sharp's marketing people have obviously assessed, would be rare and hardly a hindrance to the PC-6220's chance of success.

The external 3.5in floppy option will be priced at \$480, the expansion unit at \$1100, monitor adaptor at \$200, numeric keypad at \$130, carry case at \$155, and the PC-6220 itself is expected to be available by the time you read this.

If the finished product shapes up as well as the preproduction model I've described, the machine is a winner.

END



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The critics' choice ...

“The Dario 286 displays some of the best engineering seen in a 286 box. It is well designed, well manufactured and contains high quality components, in particular a voice-coil hard disk. **Chris Bowes, PC Week 3rd May 1990.**

As a quality machine, deliberately priced to fit the lower to middle price range, the compact and strongly constructed Triumph-Adler 286 AT would be hard to beat. **Max Pinner, The Australian 23rd January 1990.**

The Dario 286 wins hands down on styling, sturdiness and quality of internal design. The keyboard and video are state-of-the-art and a pleasure to use. **Geoffrey Ebbs, Australian Personal Computer April 1990.**

After running the Core Disk Performance Program, I received this report . . . This is the ultimate in hard disk performance. It exceeds all IBM specifications by more than 30% . . . **Jon Doust, Pacific Computer Weekly 2nd March 1990.**”

The TA Dario 286 is serviced and supported nationwide by the original manufacturer, a company with over 100 years experience in manufacturing office machines.

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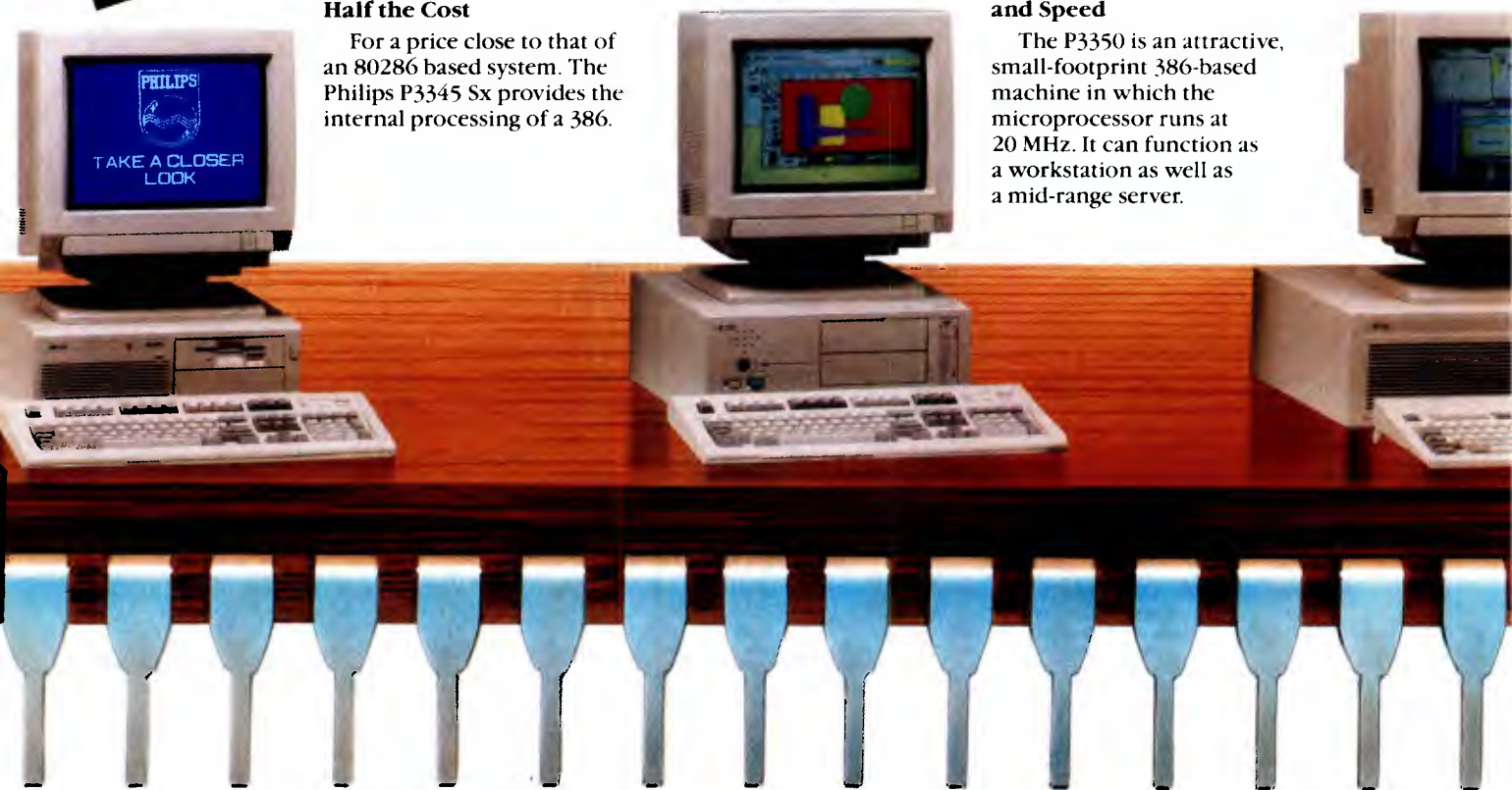
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The Sun SLC

What's the difference between a workstation and a PC? That's a question thrown into sharp relief by the release of the Sun SPARCstation SLC. Phil Cohen proffers an answer

Workstations are basically superminicomputers in small boxes. They owe their genealogy to the Unix minis made for things like CAD and heavyweight engineering design. A PC is a home computer grown large, and a workstation is a mainframe grown small. Both have evolved quickly.

The big news about the SLC is its pricing rather than its capabilities. Workstations with these features have been around for a while now, but the price of an SLC with a 200M hard disk, 8M of RAM and a floppy is around \$12,000 including tax. In comparison, \$12,000 will buy you a medium-priced 486 PC.

Although the SLC will run MS-DOS software, the comparison isn't

straightforward, as it does so by means of a software emulator which slows it down to the speed of an XT. It also has other limitations, making it impossible for the SLC to be a straight PC replacement.

This can be best understood with a background of Unix itself.

Current workstation diet and habitat

Workstations are most commonly found these days in engineering environments rather than traditional PC territory — accounting, for example. People buy workstations to give their engineers more computing muscle. One of the reasons for this used to be the price: workstations used to cost two or three times the price of even the most expensive PC. Another reason was the operating system that workstations use: Unix.

Unix has been around for several decades now and has gathered a large number of adherents in fields like computer science and engineering. Its major strengths are ease of networking, flexibility and software transportability. However, it also has a major flaw — it's difficult to use. The continuum of usability in the personal computer world follows as such: Mac (easiest), MS-DOS, OS/2, and Unix (hardest to use). Unix isn't impossible, it's just hard.

Unix GUIs

To try to get around Unix's worst feature, developers have been working on GUIs (Graphical User Interfaces) to make Unix a less hostile environment in which to work. These are to Unix as Gem and Windows are to MS-DOS, and as the Presentation Manager is to OS/2.





The GUI which runs on the SLC is called 'Open Windows'. It's written around the X Windows specification and uses Display PostScript to control the screen.

Using Open Windows is pretty much like using any other GUI on a Mac or a PC — you grab, click and double-click. Unfortunately there is a difference between Open Windows and PC and Mac GUIs: Open Windows is still full of rough edges. For example, to close the machine down, you have to exit Open Windows and then enter two obscure Unix commands — 'su -' and 'shutdown -h now'. I have no doubt that it is possible to do away with the entry of these — in fact, when I commented on them, the person installing the machine tried to write a macro to take care of the problem right there and then.

Another problem with Unix (which admittedly is much more of a headache on a desktop machine than it is with a mini) is that if you turn off the power on a Unix box — even when you have no applications running — you may lose or corrupt files, just by pulling the plug. When no applications are running, this can never happen with MS-DOS. A couple of times, we actually had to turn off the power without shutting down because the operating system hung on us. To its credit, Unix tries to fix file problems caused by this sort of abuse, and we understand it is successful most of the time.

One of the applications supplied with the review machine was a very impressive 8-bit sound sampling and playback package. There were a number of sound files on the machine's hard disk, which gave very good sound quality (although mono) through the SLC's built-in speaker.

A 'snapshot' application capable of capturing a picture of any part of the screen for documentation purposes brought a gleam to my eye; until I found out that snapshot didn't work with the sound utility. Another rough edge.

Things like this went on all through my playing with the machine. It's not so much that there's anything badly wrong with the software, it's simply not 'mature' yet, and still has a few bugs.

Networks

One of Unix's strengths is the fact that it was built from the ground up as a multi-user, multi-tasking operating system. Adding more users to a network of SLCs is going to be fairly straightforward, especially as it has all of the networking hardware built in. Sun also tells me it's possible to hook one of these into a PC network. In fact, in a commercial en-

vironment, networking is going to be one of the SLC's few advantages over fast PCs. PC networks are nowhere near as easy to maintain as Unix networks (even taking Unix's usability problems into consideration).

Being a technical writing company, we've just about standardised on Xerox Ventura for our in-house desktop publishing. We don't use the networked version of Ventura, not because we don't need a network, but because we don't need one enough to pay around \$2000 per machine for the hardware, plus a licence for the software, having to set aside one machine as the server, and so on. PC networks are a pain.

There's a desktop publishing product called Interleaf which does pretty much what Ventura does (perhaps a little more), but runs on workstations like the SLC (there was a copy on the review machine). To hook another SLC box into a network all we'd have to add would be a cable.

That's a big difference given that the SLC costs around the same as a PC. The catch is that as Interleaf used only run on \$20,000 workstations, it's priced accordingly. Ventura costs a good deal less.

Technical specifications

Sun SLC

Distributor:	Sun Microsystems
Telephone:	(02) 413 2666
Price:	Around \$12,000 (final price not determined at press time)
Processor:	20MHz SPARC processor (rated by Sun at 12.5 MIPS), with Weitek floating point coprocessor fitted as standard
Memory:	8M standard, expandable to 16M on-board (no slots — so no further expansion possible)
Disk interface:	SCSI-2 port — can be connected to many Mac-compatible hard disk and CD-ROM drives; note that disks are optional as the unit is designed to operate as a diskless workstation
Disk drives:	A variety of add-on external disk drives are available from Sun, including a 200M hard disk with built-in 3.5in 1.4M PC-compatible floppy, CD-ROM drive and various other hard disks
Screen:	17in mono, 1152 by 900 resolution
Keyboard:	107-key non-IBM-standard (but designed to allow easy use of PC packages)
Mouse:	Three-button optical mouse included
Operating system:	Unix (SunOS 4.0)
Serial port(s):	One connector providing one full RS-232 connection and one limited (no modems) connection
Audio:	Internal speaker, optional external speaker and microphone; hardware capable of recording and playing speech-quality sound in mono
ISDN:	Hardware is capable of plugging directly into a Telecom ISDN socket, with additional software from Sun (not yet available), plus an adaptor and cabling
Ethernet interface:	Thick Ethernet connection; converter to thin Ethernet available

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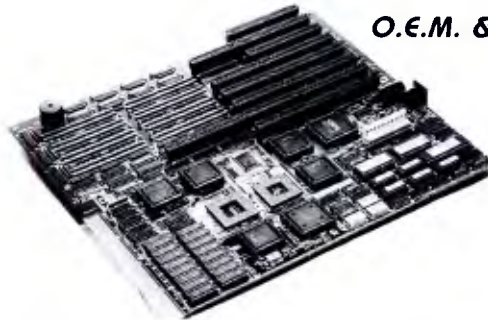


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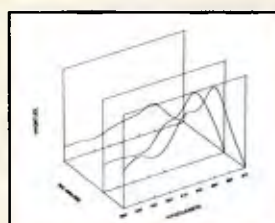
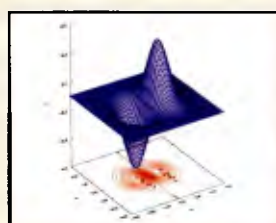
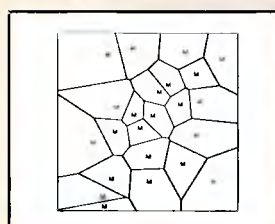
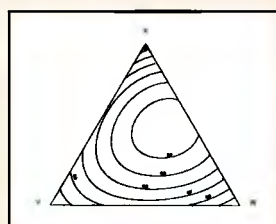
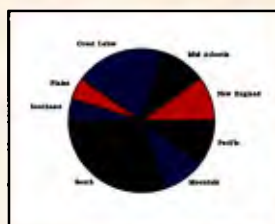
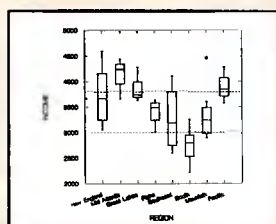
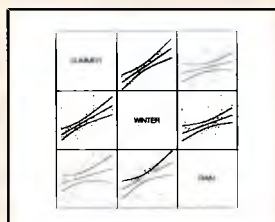
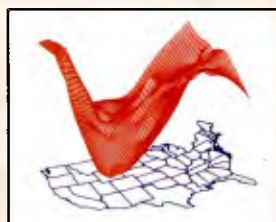
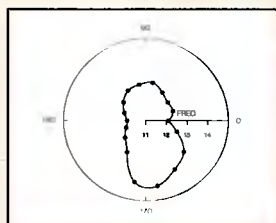
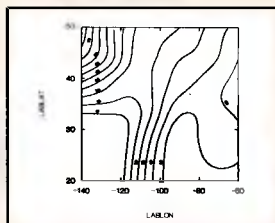
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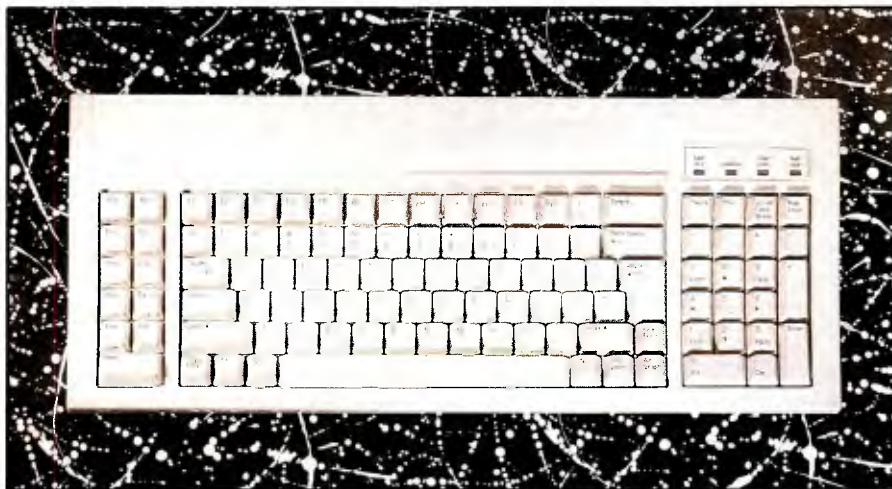
Emulation and ported applications

An emulator is a program that allows one processor to act like another. There is an MS-DOS emulator available for the SLC, and my comments on it are contained in a box at the end of this article. The bottom line is that it runs DOS applications about as fast as a 6MHz XT — not bad for an emulator.

There are, however, a number of PC applications being rewritten to run under SunOS directly. One of them — the venerable Lotus 1-2-3 — was finished, and actually loaded on the review machine. This version is called Lotus 123 V1.0 for the Sun, but Lotus tells me that it is just about identical to V3.0 for MS-DOS.

I started Lotus and, sure enough, it works just like Lotus on a PC, except that it runs in its own window, the graphs turn up in little windows of their own, you can run multiple versions of it simultaneously and it has virtually no memory constraints.

How fast will the SLC run your spreadsheets? We benchtested the SLC against one of the fastest PCs on the market: the Compaq 486. The results were a surprise to us: the Compaq beat the SLC hands down. For a test consisting mainly of real calculations, the Compaq took 34 seconds to the Sun's 44 seconds. We had always thought of workstations as being much more powerful than PCs, but it looks like the smallest workstations actually overlap the fastest PCs.



Despite its Unix heritage, the Sun's keyboard will feel familiar to PC users

Who is going to buy them?

Although the SLC looks at first glance like a replacement for the PC, it's not. At least, not yet.

Let me explain. If you are an engineer and you want to develop a super-duper graphing package for showing the pion concentration in the shuttle zero-g toilet, then you will buy the SLC (if 12.5 MIPS is enough power for your application). When Unix falls over on you, you grab your Unix manuals (of which there are many volumes) and try to remember what you learned about the operating system at uni.

If you are a software developer about to start work on a stock price charting package for use by stock brokers, you will

buy the SLC. Networking and communications are no problem with this sort of technology. When Unix falls over, the stock analysts will sip brandy while a white-coated techo roadie hammers the SLC's keyboard to find out what went wrong. This, by the way, is the type of market into which Xenix (a cut-down PC version of Unix) is already making inroads.

Now let's try another type of user: the finance director in a small widget factory. You already have ten or fifteen PCs dotted around the place, but you want something bigger to run your humungous Lotus spreadsheet of the world widget market forecast over the next thirty years (widget by widget). And you'd like to be able to run multiple versions of Lotus, too.

Not knowing a great deal about computers, you ask one of your technical people (who knows about PCs) what you should buy. She scratches her head and says "You could buy a 486, but what about a Sun SLC? It runs Lotus and it's cheaper." You buy one.

When Unix falls over on you, you call back the technical expert, but she only studied Unix for two lectures and can't help you. So you call your dealer.

Here the crystal ball gets cloudy, because Sun hasn't decided yet who its dealers will be. But, if the rest of the computer industry is anything to go by, and if the finance director (as finance people do) bought from the lowest-price source somewhere in Tweed Heads, then he's going to have no luck at all in trying to get his problem fixed.

Sun reckons that it can offer a full year of on-site warranty for under \$1000, so getting the hardware fixed is not going to be a problem. But, for how long will Sun answer silly questions about the software from people who think troff is something you feed pigs from?

And that's it in a nutshell. Although

The Lotus speed test

The test was set up as follows:

- Set cell A1 to +A5000+1
 - Set cell A2 to @sin(a1)
 - Copy A2 to A3..A5000, so that A3 is @sin(a2), etc
 - Set B1 to +B2+1
 - Set B2 to +B1+1
 - Change recalc to automatic, and set iterations to 50
 - With the cursor on cell A1, press F2 (edit), and then the Enter key to start the timing
 - When cell B2 shows 100, stop the timer
- We had to use cells B1 and B2 to do the actual timing because in the Sun version of Lotus (which is identical to Lotus V3.0 under DOS), the READY signal appears after the first calculation — the rest of the iterations

go on in background, and you are free to move the cursor around while the numbers change.

The Compaq 486 running at 25MHz took 34 seconds for this test, while the Sun SLC took 44 seconds. The SLC had no other applications running.

The first test we tried on the Compaq was running Lotus 3.0 (which Lotus told us was source-code identical to the Sun version) under MS-DOS 3.31. To make the test a little fairer, we thought we'd run it under a multi-user operating system on the 486 as well; it didn't make much difference. The timings were Xenix 386, 36 seconds; and OS/2 1.2, 34 seconds.

(The GUI version of 1-2-3, 1-2-3/G, ran the test in 45 seconds under OS/2 1.2; but then it's not code-identical to the Sun version, so this last result may not mean much.)

Many thanks, by the way, to the people at Lotus Development Corporation's office in Sydney who provided access to the hardware and software for the comparisons at short notice.

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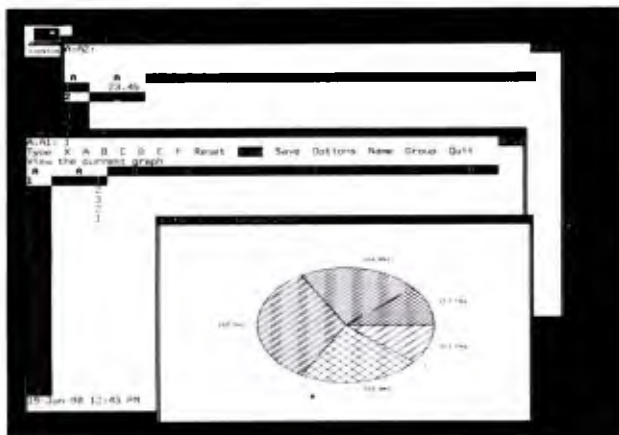
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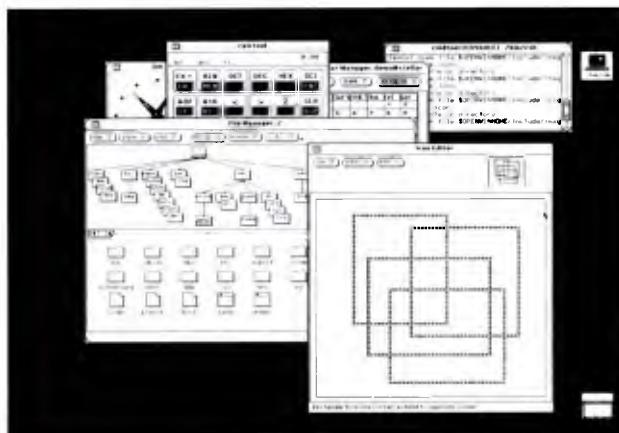


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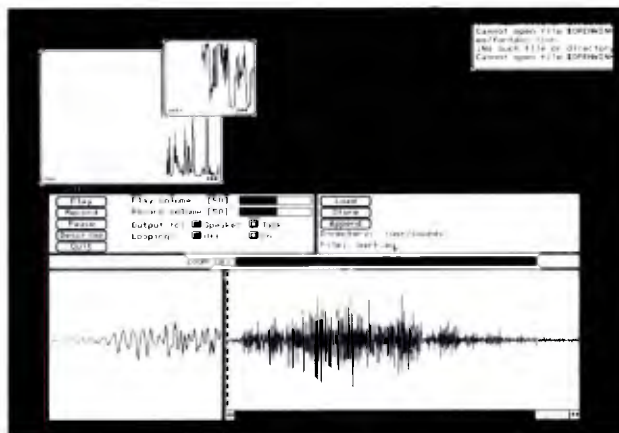
BENCHTEST



Under Unix, you can run (and recalculate) two or more Lotus spreadsheets at a time



The Sun's standard operating system has lots of goodies



The sound tool uses the internal speaker to reproduce reasonable-quality mono. Also shown is a 'performance meter' monitoring CPU and interrupt usage

MS-DOS is not exactly friendly, at least it's well-known. And if OS/2 is a little less friendly, at least it's a lot like MS-DOS. There just isn't the depth of knowledge in the PC market to properly support a Unix box for run-of-the-mill applications.

If you're going to look at an SLC for everyday applications, make sure you have a good line of support.

Will the SLC sell?

Although the SLC is not a 486-replacement, it will sell very well indeed because first, there is already a market for it, and second, it represents very cost-effective Unix computing.

Interestingly enough, Sun's US parent is targeting the SLC firmly at the diskless workstation market. Over in the US, there are no plans to sell it bundled with hard disk drives and pretend it's a PC. The Sun representative mentioned something about the complexity of the US market, but I suspect that there may be some other (commercial) reason that stops them trying to compete with the 486 boxes head on.

The hardware

The most impressive parts of the SLC for me were: a) the price, b) the electronics itself, and c) the price.

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Lotus users

When the Sun representative unpacked the SLC, I had to ask him where the computer was. I could see two squat boxes (which turned out to be two hard disk drives) and a monitor, but no processor unit. Could they have forgotten to bring one?

No, the processor takes up the back five centimetres of the monitor case. I was a little stunned at this as the whole processor board (there is no motherboard or plug-in cards, just one board) and shielding fits into a space of about 30 by 20 by 5cm.

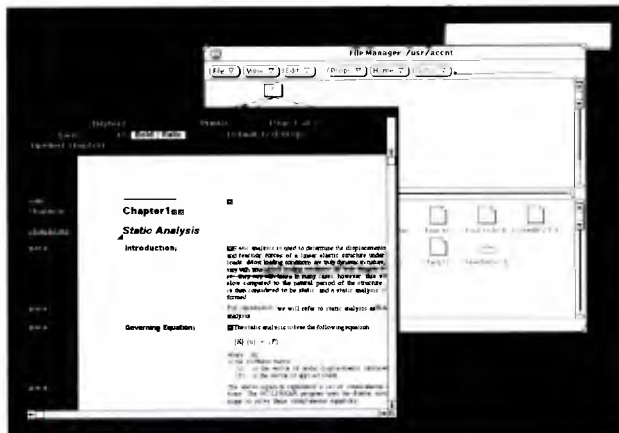
The processor runs on around 10W (the electronic equivalent of an oily rag), and could just about exist on batteries. It doesn't even need a fan.

The next most impressive thing about the box is its number of interfaces. These include a SCSI-2 port (for connecting to almost any number of hard disks, CD-ROM drives and what have you), a modem port, an ISDN interface (although there is no software for it yet), audio input and output sockets, and thick Ethernet (fitted as standard).

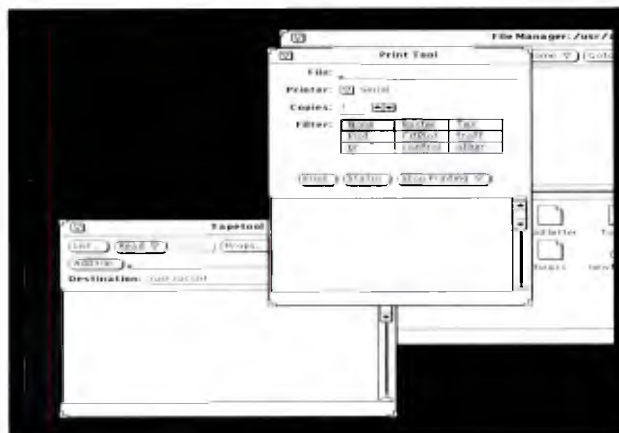
Speaking of CD-ROM, Sun officials tell me there is a CD-ROM drive on the way for this machine with an anticipated price of \$2000. Sun has just about standardised on the distribution of software on CD as well.

The screen is also very impressive, rating at around 100dpi (dots per inch). However, as yet there is no colour version.

If this were a PC, the only thing that would be missing would be a parallel printer port. Now I come to think of it, that's not such a trivial problem: unless you have a serial printer or an Ethernet network, there's no way to get printed copies out of this thing.



The Interleaf desktop publishing system: if they bring the price down, they might sell a few more



Unix print and tape tools made friendly

Documentation and software

The standard of the documentation is very high (I understand it won an award in the US). There's a hardware installation and maintenance guide, a user guide, and a network/system manager guide.

The operating system supplied with

the SLC is Open Windows, running under Unix. Open Windows conforms to the X Windows user interface standard, so you operate it like any other X Windows implementation.

There are a number of interesting software tools bundled with the box, including a simple windowed text editor, a terminal emulator, a graphics file



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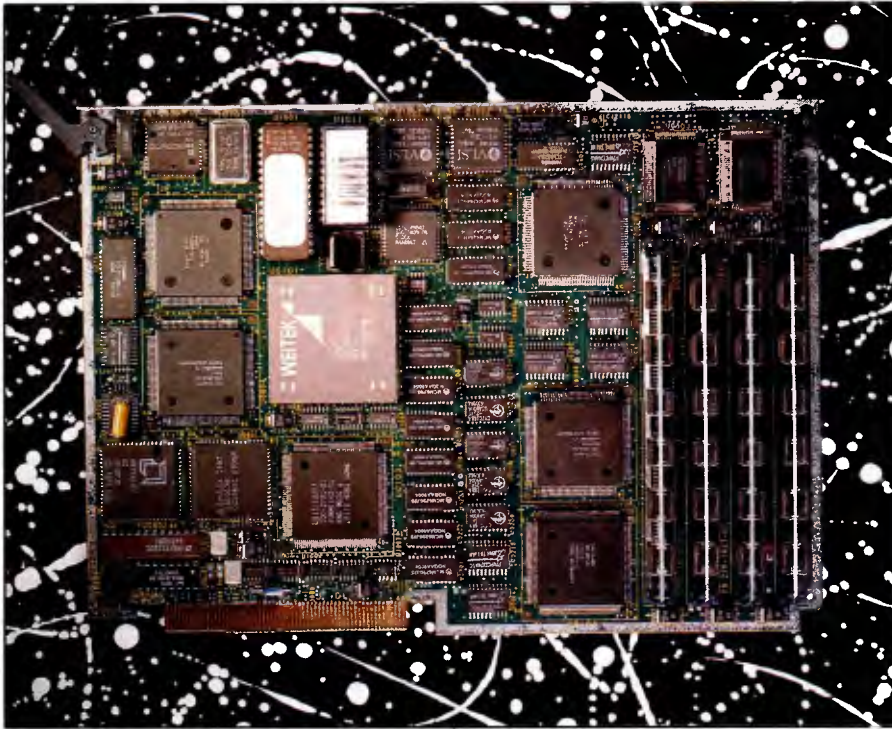
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The low-component main processor board slips in behind the Sun's monitor

management utility, a clock, a calculator, a diary, etc, etc.

Conclusion

The SLC is a very impressive piece of kit. The engineers who worked on it deserve to be congratulated for cramming so much functionality into such a small space. The price is also partially due to the engineering — a small parts count nearly always reduces manufacturing costs.

There is definitely a market for the SLC. People who would otherwise be buying workstations from other manufacturers are going to fall over each other to buy

Sun's latest. Developers looking for a platform for a dedicated application will go for it as well. If companies like Interleaf can get their pricing together, then network-hungry applications like group desktop publishing will be a good market too.

But should you buy one as the next step up from the 486 on your desk? I wouldn't.

END

Phil Cohen is a consultant with Hard Copy, a Sydney technical writing company which specialises in user and systems documentation. He can be contacted on (02) 247 3437.

MS-DOS emulator

An emulator is a program that runs on one processor and makes it operate like another processor. In the case of the Sun, the emulator in question runs under X Windows and provides a more or less completely compatible PC environment side by side with other X Windows applications.

The DOS window is opened just like any other Sun application, except that you can only have one DOS window active at a time.

The processor which is emulated on the Sun seems to be a 286 (judging from the fact that the BIOS is a Phoenix 286 version). The DOS version is 3.3.

Although there is a floppy drive available for use with the DOS emulator, Sun was unable to provide one for this review. So, in order to test the speed of the emulation, we had to write a little timing loop program under GWBASIC. The results were as expected: the Sun DOS window runs about as fast as a 6MHz XT.

Access to Unix files from DOS was easy — they appeared as normal DOS files. The only difference was that filenames longer than the DOS 8+3 character limit were truncated and had tildes (~) in them.

Because of the lack of a disk drive, we couldn't try the traditional DOS compatibility tests (Flight Simulator, etc). If you must run Flight Simulator on your Sun workstation, try before you buy.

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Playing the DOS shell game

Bruce Brown helps you cut through the confusion and find the right DOS shell by deciding how knowledgeable a user you are, how knowledgeable you want to become, and how far away from the C: prompt you want to get.

DOS shells live! Three years ago, it wouldn't have been outrageous to assume that by now everyone would be using OS/2 Presentation Manager or Microsoft Windows — and DOS shells would be dead. Today, however, most of us are still living with plain, old, unadorned DOS in all its inscrutability. DOS 4.01's Shell program substitutes menu choices for command names that have to be remembered and typed, but that in itself is not a big enough step toward true user-friendliness. Plain and simple, DOS is too tough for beginners and too dumb for everyone else.

To find ways to make DOS easier to use

for everyone from novice to expert, we've evaluated eight DOS shells; perhaps we should call them eight programs that can act as DOS shells. There is a surprisingly wide variety of products on the market today that include the classic DOS-shell functions of disk and file management, easy DOS command usage and application launching. The confusion gets even worse when you consider the desires of different types of users, all of whom could benefit from using a shell. Beginners need simplicity and hand-holding, and want to be protected from DOS. Expert users want speed and extra functions, and often resent having to work through the very same menus that novices love. Intermediate users fall somewhere in the middle but are likely to want both convenience and extra functions.

Meanwhile, PC managers responsible for maintaining computers for other users want DOS shells with good menu-making capabilities, passwords, custom help screens and assignable user rights (this last feature will keep some users from ever having to see a DOS prompt). People who travel with portable computers that lack hard disks want as much functionality in as little space as possible.

Not to worry. There's a DOS shell for everyone.

What to look for

A good DOS shell must provide all of DOS's file and disk functions in an easier or more convenient way than does DOS itself, and it must have functions DOS





doesn't include. Since most DOS commands involve file, directory or disk operations, it's essential that DOS shells shine in that area, making it easier to organise and manipulate applications and the files they create.

Many of the shells we looked at have menuing functions that let you set up your own application menus, but we didn't evaluate products like Delta Technology's Direct Access, which was designed specifically as a menu generator. A few of the programs we tested can set up application menus automatically, identifying your programs anywhere on your drives as if by magic. These shells work by finding the executable files that start the applications, recording their locations, and putting them in menus often according to application category.

More than half the programs have launch-and-load facilities that you can use to select a file from a directory listing, then automatically start the program that created it and load the file. Even the MS-DOS shell program lets you set up a table to associate file extensions with executable application programs (see the text box 'The DOS shell you'll find in DOS').

Features above and beyond

The list of additional features that some of these shells have is extensive. While some of the programs, notably Q-DOS II, reflect their designers' preference to hold back on features to ensure that novices will not be overwhelmed or confused, others pile on every feature they can think of. The best example of the latter, by far, is PC Tools Deluxe 6.0.

There are also plenty of alternatives to commercial DOS shell programs. Many user-group bulletin board systems have public-domain DOS shells. We didn't review public-domain shells because they're subject to such frequent change. One of the programs we evaluated, PowerMenu, is available as shareware (this applies only to version 4.5, not version 5.0). You can try it for free; if you like it, send a registration fee to the vendor to get a manual, technical support and upgrade alerts.

The range of features and user interfaces in these eight programs is extensive. DOS shell preferences can be as subjective as keyboard choices, so as you read the reviews look for the functions you need and the style of operation that best matches your computing tastes. All of the programs we looked at worked as documented, and there isn't a truly bad choice in the lot. The differences are found in the shells' function sets, interface styles and targeted users. Whether you're a beginner or an expert, a DOS

shell can bring greater convenience and productivity to your computing. The good news is that with such a wide variety of programs, you can get that convenience the way you want it.

HyperPAD

If you want a DOS shell but aren't satisfied with anything you've seen, Brightbill-Roberts' HyperPAD may be just what you are looking for. This \$220 custom development tool lets you set up your own DOS environment controller or interface, or design a front end for any other application you wish. HyperPAD combines deceptively simple development tools with a powerful scripting or programming language.

HyperPAD isn't a DOS-shell program itself, but it does come with one. We included HyperPAD in this feature for two reasons: what it has and what it can do. It comes with a set of predefined 'PADS' that include many desirable file and disk-management tools and other desktop utility programs. HyperPAD is also beautifully suited for creating your own DOS shell, either by modifying the existing PADS or starting from scratch.

The preprogrammed PADS were included with HyperPAD to show the potential of the program and so people can learn how to work and possibly think in a HyperPAD environment. There are 12 PADS, including one called the DosPAD. The DosPAD doesn't use graphic directory trees, but it does include several directory functions such as file tagging for multiple file copying, moving and deleting. You can also create and delete directories and use copy, move and delete functions for whole directories, subdirectories and their contents. You can search a drive by name, but the DosPAD doesn't include wildcard searching support or searching for character-string matches in files.

If you want a DOS shell to help start applications, HyperPAD makes a lot of sense. From one perspective, creating custom menus is what this program is all about. You can start programs from menus and also set HyperPAD to start

SUITABILITY TO TASK	
HyperPAD	
Simplification of DOS usage	4
File and directory management	4
Additions to a user's tool set	4
Customisation/automation of frequent operation	4

DOS shells: suitability to task

Which DOS shell gives you the specific features you need? APC's suitability-to-task ratings offer one way to help you decide. These are systematic though subjective ratings provided by our reviewers: for a more complete picture of what each product offers, compare these judgments with the information in the reviews and the features table.

The tasks

Simplification of DOS usage Anything that helps beginners avoid having to manually enter DOS commands takes the edge off the often unfamiliar and demanding syntax. Menus, prompts and aids that issue commands — complete with parameters — can save you time as well. Simplicity and intuitive program design are important, of course, and programs with multiple user levels deserve a gold star.

File and directory management Shells that score well here have added functions that DOS doesn't or else they combine functions into fewer steps. Good file and directory management isn't just copying, deleting and moving items. It also includes native file-format viewing without loading the application, rapid access to file and directory statistics, file search and sorting functions, and the ability to work with multiple disks.

Additions to a user's tool set Does the shell have features like user and program passwords, usage logs, a DOS command history or telecommunications and file-transfer modules, as well as its file and

SUITABILITY TO TASK

Product Name

Simplification of DOS usage



File and directory management



Additions to a user's tool set



Customisation/automation of frequent operation



disk utility programs? Several of the programs can scan disks to find common programs and enter them into user menus, while some also allow you to point to programs to automatically run them and load files. Feature-heavy programs score well here.

Customisation/automation of frequent operation Here we evaluate a program's ability to customise or automate operations. To score well, a program should have macro and script languages, and tools that PC managers can use to set up menus and customise interfaces for less-experienced users.

The ratings

- 0 Lacking the feature or completely unsuited for the task.
- 1 Poorly suited for the task.
- 2 Somewhat capable.
- 3 Well suited.
- 4 Excellently suited. Your best choice for the task.

applications automatically when you point to and select applications files; a process often referred to as launch and load. You can also password-protect menu items to restrict access.

Extra utilities

Other features in HyperPAD's PADS include a calculator, notepad, name and address list, daily planner and a card file. You can use it to compress files, and there's a moderately powerful telecommunications module that you can use as a phone dialer. You can also customise via HyperPAD's advanced script language to automate regular telecommunications tasks.

The selection of predefined functions in HyperPAD is okay, but if that were all you could do with the program, we'd say, 'Easy to use but limited; too costly for what you get'. However, don't forget that the predefined PADS are just samples. HyperPAD's greatest value is as a not-so-secret weapon.

HyperPAD is widely touted as bringing the best of the Apple Macintosh world to the IBM-compatible world. If you associate with Macintosh users, you may have become bored with the talk about HyperCard and card stacks. Mac users often gush about the greatness of HyperCard — great, meaning easy to use and flexible enough to handle any information you can display on a computer screen. Interestingly enough, and of special significance for this review, many of the people who are most enthusiastic about HyperCard are non-programmers — computer beginners enticed by HyperCard's capabilities.

Programming language

While IBM users have had macro recorders and programmable function keys, until HyperPAD we had nothing like HyperCard. Essentially, HyperPAD is an object-oriented development tool accompanied by a powerful scripting (programming) language.

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HyperPAD is an applications development tool well suited to designing user menus and interfaces. In this screen, HyperPAD's DOS PAD lists drives, directories, files and PAD-specific DOS command buttons. You can use the DOS PAD as it is, change it or create your own by using HyperPAD as a programming tool

You can use HyperPAD in five modes: Browsing, Typing, Painting, Authoring and Scripting. In Browse mode you look through PADs and activate programs or functions via PAD 'buttons'. In Type mode you can add, move and copy in-

it), you can still get terrific value from HyperPAD. If you venture into PADTalk, you may be surprised to discover that programming doesn't have to be hard, though certainly PADTalk requires more thought and planning than using the other HyperPAD modes.

At a glance

HyperPAD, version 1.0

Distributor: Technical Imports
Telephone: (02) 922 6833
Price: \$220
Requires: 384K of RAM, DOS 2.1 or later. Hard disk recommended
In short: HyperPAD is primarily an applications development tool that you can use to build your own DOS shell. A useful collection of pre-written 'PADs' is included with the program, but HyperPAD shines because of its relative ease in setting up user interfaces and interactive systems. This program is not for beginners, but if you have moderate programming skills and want to try some high-powered design experiments, HyperPAD is for you.

Why HyperPAD?

If you would like to set up your own DOS shell and want something more than what you can do with DOS batch files, but don't want to get into more complicated programming, HyperPAD is a possible solution. With its standard predesigned PADs, HyperPAD provides you with a very good start — certainly enough to live with until you get used to working in the HyperPAD environment. If you start to experiment or get down to some serious design and implementation, HyperPAD's strength and facility as an interface-design and programming tool will show through very clearly.

The Norton Commander

Why not let the commander take charge. If you understand DOS but are looking for convenience, Peter Norton Computing's The Norton Commander, version 3.0, offers a variety of features unmatched by other shell programs. This \$225 software package isn't the best DOS shell for beginners, but intermediate to expert users will find much to appreciate.

To use Commander you need at least 256K of RAM, since the program takes 178K during operation, dropping to 13K

formation. In Paint mode you can alter the appearance of PADS with drawing and colouring tools, as well as import files from other drawing programs. At the Authoring level you control how buttons work and make connections between various program and PAD features.

HyperPAD's highest level, Scripting, uses a programming language called PADTalk which, like Apple's HyperTALK, is a high-level language with commands, functions, fixed and variable values, and operation-flow control structures. If you never use PADTalk directly (it controls the other four HyperPAD levels, but you don't see

SUITABILITY TO TASK



when it starts other applications. Commander takes over 800K of disk space, but you can cut back if you erase non-essential file-format viewers. If you don't have a hard disk but have enough memory, you can maintain Commander in RAM while you run other software, saving the need to reinsert program disks after exiting an application.

When you start the program with the standard installation, the right half of the screen contains a three-column file listing and the bottom lists current function-key assignments. F9 turns on the top-line menu from which you can select other operations. Some DOS commands listed in the Files pull-down menu include selections to copy, rename and delete files. You can activate commands with single-letter keys, by mouse selection or with function keys. Novices may find the interface confusing, but more-experienced users will appreciate the variety of activation

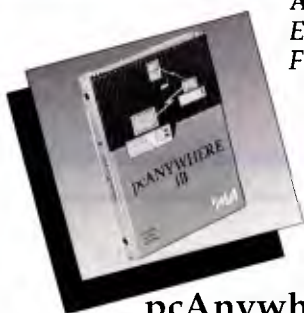
At a glance

The Norton Commander, version 3.0

Distributor: PC Extras
Telephone: (02) 319 2155
Price: \$225
Requires: 256K of RAM, DOS 2.0 or later. Hard disk recommended
In short: The Norton Commander has powerful file-management features, including user-defined menus, file viewing in many program formats, and a launch-and-load function. Also included are Commander Mail for accessing MCI Mail and Commander Link for file transfer between computers. It is intended for all users and especially suitable for laptop users.

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LaserTools

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Available In:
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PowerMenu

PowerMenu, long a standard issue on all hard disk PC in major corporations and governments worldwide. Version 5 features a powerful yet user friendly Menu System, taking less than 3K of RAM, that runs up to 10,000 programs at the press of a single key, and a File Manager. Individual users log onto menus customized by the supervisor for their needs. Programs are password protected and all usage is tracked and accounted-for. Job Accounting is a standard feature. DON'T LEAVE DOS WITHOUT IT. Lan versions available.

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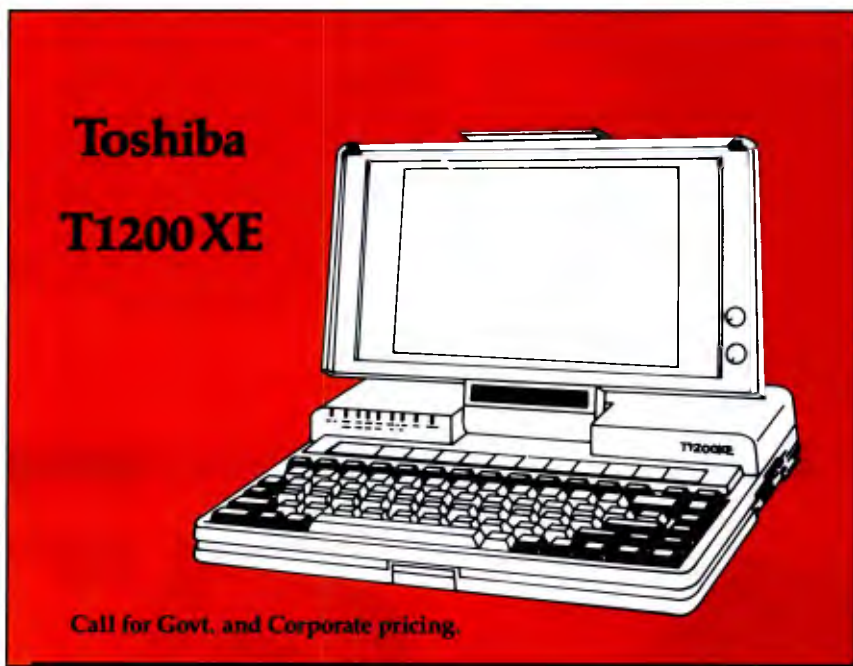
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80286	6/16	1MB	40MB-28ms	1.2MB	1/1/1	\$2,049	\$2,149	\$2,799	\$2,999
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386SX	6/16	1MB	40MB-61ms	1.2MB	1/1/1	\$2,199	\$2,299	\$2,999	\$3,199
386SX	6/16	1MB	40MB-28ms	1.2MB	1/1/1	\$2,299	\$2,399	\$3,099	\$3,299
80386	8/25	2MB		1.2MB	1/1/1	\$3,150	\$3,250	\$3,900	\$4,100
80386	8/25	2MB	80MB-19ms	1.2MB	1/1/1	\$4,050	\$4,150	\$4,800	\$5,000
80386	8/33C	2MB		1.2MB	1/1/1	\$4,650	\$4,750	\$5,400	\$5,600
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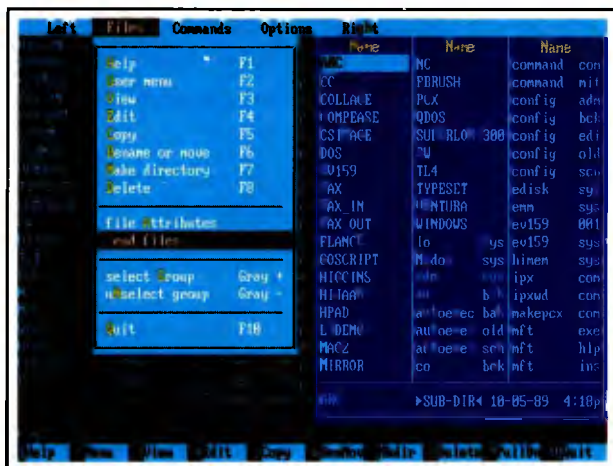
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The Norton Commander, which can display files on either the right or left side of the screen, uses a combination of bottom-line and top-line menus with pull-down menus from the latter. In this screen, the Files pull-down menu lists several of Commander's DOS functions. It's a good thing the menus are adequate, because the manual needs work

methods as well as the inclusion of the DOS command line. The number of DOS commands in the Commander menus is average for a DOS shell.

You set up the file extension list using Commander's text editor, which is also used to create single-key custom user menus.

Commander's flexibility is also seen in its disk and file management. You can configure the program to display one or two directory trees or file listings, independent or linked. You can use file tagging for copying, deleting and moving files, and you can search by file contents as well as name. Missing are the abilities to copy, delete or move an entire directory with subdirectories.

You can execute a file in a Commander file listing with the Enter key or by mouse. You can also train Commander to launch applications and load specific files by associating the file extensions with the program necessary to run them.

Shining features

Commander shines at file viewing. You can see the contents of files from most major spreadsheet, word processing and database programs, as well as .PCX graphics files, in their native formats. Commander automatically loads the correct application viewer if it's available; if not, it uses a text-view mode helpful for all except binary files.

For those keen on international electronic mail, one of Commander's most outstanding features is Commander Mail, a Lotus Express-compatible program used to access MCI Mail. You can't use this feature for any other type of telecommunications, but with Commander Mail you can set up automatic access times, log in to as many as seven MCI mailboxes, and even send binary files to other Commander or Express users. Commander makes it easy to set up distribution lists that include a mixture of recipient formats.

Commander Link is Peter Norton Computing's answer for data transfer between computers at the same location. The company sells a cable, but you have to fill in the order form enclosed with the package and send it off to the US. Alternatively, any standard null-modem cable

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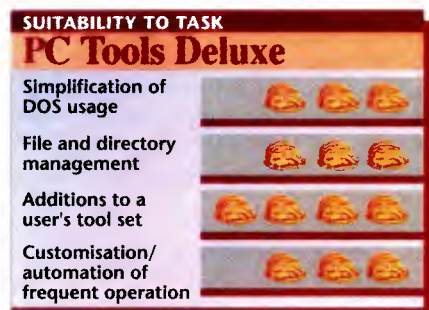
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Tony Carr & Assoc. AT APC 01/87

will allow you to transfer files between two computers via serial ports. Using Link you can copy, move, rename and delete files on either connected computer, with one acting as the master and the other as a slave.

The Norton Commander's manual is terrible. The occasionally flip style is acceptable, but it lacks such helpful structural components as a complete listing of program features or computer system requirements. The table of contents is program oriented, and the index is too limited. However, once you figure out where you need to be in the manual, the instructions for performing various operations are fine.

The Norton Commander is helpful for intermediate to expert users. The complete set of file viewers is admirable, and Commander Mail and Commander Link are particularly nice features that make the program suitable for portable PCs.



PC Tools Deluxe

It's tough to compete with PC Tools Deluxe. With each new version, Central Point Software adds to the utility's collection of fine component programs and strengthens the previous set as well. The newest edition, version 6.0, is true to the tradition. This time, Central Point has even added user levels so that beginners and intermediate users don't have to face quite as many options as advanced users.

The first thing to know about the \$245 PC Tools Deluxe (upgrades cost \$65) is that it's big. The package comes on six 5.25in or three 3.5in floppy disks. After normal installation, the files take up almost 3M of disk space, and you'll need some desk space as well for almost 1000 pages of documentation.

The manuals aren't just for show. PC Tools is certainly a DOS shell, but it is many other types of software as well: disk and file manager, file and data retriever, telecommunications program, fax manager, disk cache program, security program, disk-compression and drive-mirroring program, disk and tape-backup program, disk mechanic, and application menu program with auto-

matic program recognition. To top it all off, PC Tools Deluxe incorporates a version of Traveling Software's LapLink file-transfer program to share files between laptop and desktop computers.

A peek at the features can help you grasp the comprehensiveness of PC Tools Deluxe. You'll be hard-pressed to find a DOS-command or a file-manipulation option that you can't access from within PC Tools. If you think you'll miss the DOS prompt, don't worry because a DOS command line is always on the screen when you're in the PC Shell program, just in case you want to do it on your own.

While you're in PC Shell you can run executable files, use any of 30 file viewers, and launch and load applications by pointing to data files and automatically starting the applications.

Even with all its features, PC Tools Deluxe remains fairly easy to use. The manuals run on a bit, breaking down every step into sometimes interminable detail; you'd be better off using the manual to install the program and then using the online help, menus and prompts to learn the program. You can run the program from the keyboard but it's faster with a mouse.

Variable user levels

Central Point Software has added variable user levels to version 6.0. The number of menu choices in PC Shell and Backup vary by the user configuration, with beginners getting the fewest choices, and intermediate and advanced users getting more. The levels are a great idea and really a necessity in a program so feature rich.

In fact, PC Tools Deluxe's only limitation as a DOS shell is that it does so much, some will prefer the simpler style of more-limited programs. The sheer number of menus, options, features and functions can be overwhelming, even with the different user level configurations. While you can run the individual program components on a floppy disk drive system, most users will probably want to keep everything available all the time, which means you'd better be prepared to provide all that hard disk storage space.

PC Tools Deluxe 6.0 is

At a glance

PC Tools Deluxe, version 6.0

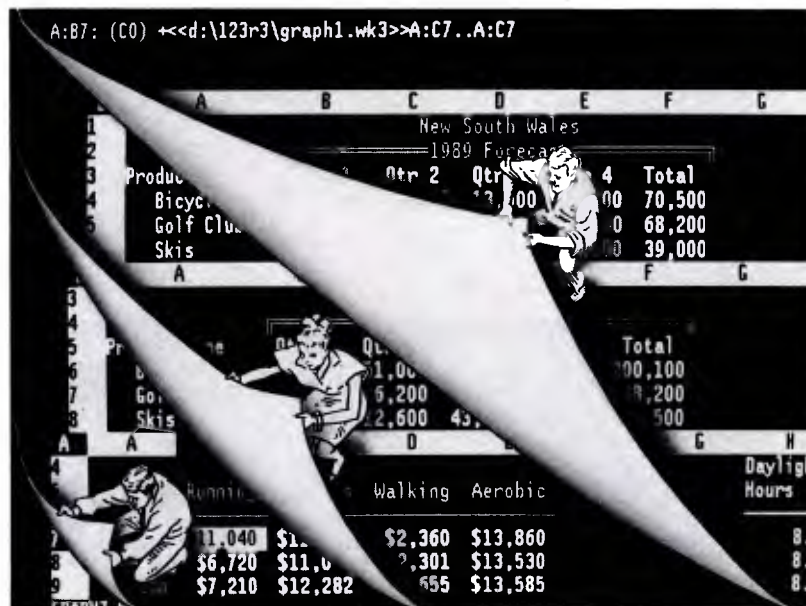
Distributor:	PC Extras
Telephone:	(02) 319 2155
Price:	\$245
Requires:	512K of RAM, DOS 3.0 or later. Hard disk recommended
In short:	PC Tools 6.0 does just about everything well. Its newest features include three levels of user interface, a drive-repair utility and an integrated version of Traveling Software's LapLink. You'll be hard-pressed to find a feature or function missing from this program.

a superior DOS shell program. It's also a terrific disk and file manager, an effective data-recovery tool collection, a superb desktop manager, an impressive computer security system, a powerful disk-backup program and a speedy disk cache program. Any two of these features are worth the \$245 price tag. When you take them as a full set and throw in all the other functions and utilities, the collection becomes invaluable. No doubt Central Point Software is already making plans for version 7.0, but let's appreciate the value of all that's here now.



PC Tools Deluxe's screen is a little busy, but with a directory tree to the left, file listings to the right, menus at the top, and stats, a DOS command line, and a user prompt at the bottom, everything you need is there. With the release of version 6.0, PC Tools Deluxe keeps getting closer to becoming a total operating environment

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*Lotus 1-2-3 Release 3 requires a 286 or 386 based PC with 1Mb RAM for DOS or 3Mb for OS/2. **Release 2.2 is recommended for 640k computers in DOS.

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DOS shells: summary of features

Products listed in ascending price order

	Q-DOS II	PowerMenu	Power Panel	Tree86 Plus	XTree Pro Gold	HyperPAD	The Norton Commander	PC Tools Deluxe
	\$123	\$135	\$150	\$179	\$200	\$220	\$225	\$245
System environment								
Works on networks	Optional	Optional	Optional	●	Optional	●	●	●
Uses expanded memory	○	○	○	●	○	●	○	●
Uses extended memory	○	○	○	●	○	●	○	●
Runs in resident mode	●	●	●	●	●	●	●	●
RAM required	128K	2.4K	94 bytes	5K	7K	2K	13K	10K
Runs as TSR	○	○	○	○	○	○	○	●
RAM required	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10-40K
Auto-install	●	●	●	○	●	●	●	●
Interface								
Centre-screen menus	○	●	●	○	●	○	●	●
Top-line menus	●	●	○	●	○	●	●	●
Bottom-line menus	○	●	○	○	●	○	●	●
Icons	○	○	○	○	○	○	○	○
Pop-up menus	○	●	●	●	●	○	●	●
Pull-down menus	○	●	○	●	○	●	●	●
Supports mouse	○	○	●	●	●	●	●	●
Generic or ASCII output only	●	●	●	●	●	○	○	●
Number of printer drivers supplied	None	None	None	None	None	14	None	None
Can print to file	●	●	○	●	●	●	○	●
File management								
Directory tree display	●	●	●	●	●	○	●	●
Copy directory or subdirectory	●	○	●	○	●	●	○	●
Delete directory or subdirectory	○	●	●	●	●	●	○	○
Move directory or subdirectory	○	○	●	●	●	●	○	●
Tag files for group actions	●	●	●	●	●	●	●	●
DOS commands:								
Attribute	●	●	●	●	●	○	●	●
Backup and restore	○	○	●	○	●	○	○	●
Compare	○	○	●	○	○	○	●	●
Format	○	○	●	○	●	●	○	●
Move	●	●	●	●	●	●	●	●
Print	●	○	●	●	●	○	○	●
Rename	●	●	●	●	●	○	●	●
Volume label	○	○	○	○	●	○	○	●
Xcopy	●	○	○	●	●	○	○	○
Sort files by filename	●	●	●	●	●	○	●	●
Sort files by date	●	●	●	●	●	○	●	●
Sort files by file size	●	●	●	●	●	○	●	●
Search for filename	●	●	●	●	●	○	●	●
Search for file contents	○	○	●	●	●	○	●	●
Wildcard searches	●	●	●	●	●	○	●	●
Utilities								
Runs applications from menu	○	●	●	○	●	●	●	●
Runs applications via DOS command line	●	●	●	●	●	○	●	●

DOS shell: summary of features

	Q-DOS II	PowerMenu	Power Panel	Tree86 Plus	XTree Pro Gold	HyperPAD	The Norton Commander	PC Tools Deluxe
	\$123	\$135	\$150	\$179	\$200	\$220	\$225	\$245
Sets up file folders or directories	○	○	○	○	○	○	●	●
Attaches comments to file	○	○	○	○	○	○	○	○
Launch-and-load capability	○	●	●	●	●	●	●	●
Menu maker	○	●	●	○	●	●	●	●
Application switcher	○	○	○	○	○	○	○	●
Memory map display	○	●	○	●	○	○	○	●
Text editor	●	○	●	●	●	○	●	●
Print from text editor	●	N/A	●	●	●	○	○	●
File viewer	●	○	●	●	●	○	●	●
Formats	ASCII, hex	N/A	ASCII, hex	ASCII, hex	ASCII, dBASE, hex, Lotus .WK1, Microsoft Word, Multi-Mate, Word-Perfect	N/A	ASCII, dBASE, hex, Lotus .WK1, Microsoft Excel, Microsoft Word, Microsoft Works, Multi-Mate, Paradox, R:base, WordPerfect, XyWrite	ASCII, dBASE, hex, Lotus .WK1, Microsoft Excel, Microsoft Word, Microsoft Works, Multi-Mate, Paradox, R:base, Word-Perfect, XyWrite
Graphics	None	None	None	None	None	CX2	.PCX	.PCX
Macros	○	○	●	○	○	●	○	●
Macro recorder	N/A	N/A	○	N/A	N/A	○	N/A	●
Macro editing	N/A	N/A	●	N/A	N/A	●	N/A	●
Calendar	○	○	●	○	○	●	○	●
Schedule	○	○	●	○	○	●	○	●
Calculator	○	○	●	○	○	●	○	●
Telecommunications facility	○	○	●	○	○	●	●	●
Telephone directory	N/A	N/A	●	N/A	N/A	●	●	●
Auto-dialing	N/A	N/A	●	N/A	N/A	●	●	●
Auto-log-on	N/A	N/A	●	N/A	N/A	○	●	●
Terminal emulation	N/A	N/A	●	N/A	N/A	○	○	●
Script language	N/A	N/A	●	N/A	N/A	●	○	●
Can attach binary files	N/A	N/A	○	N/A	N/A	○	●	●
Clipboard	●	○	○	○	○	●	○	●
File compression	○	○	○	○	●	○	○	●
Drive compression	○	○	○	○	○	○	○	●
Number of drives handled simultaneously	2	1	26	26	26	1	2	2
Data transfer capability	○	○	●	○	○	○	●	●
Serial connection	N/A	N/A	●	N/A	N/A	N/A	●	●
Parallel connection	N/A	N/A	○	N/A	N/A	N/A	○	○
Drive mirroring	○	○	○	○	○	○	○	●
Drive cache utility	○	○	○	●	○	○	○	●
Notepads	○	○	●	○	○	●	○	●
Outlining	○	○	○	○	○	○	○	●

● — Yes ○ — No N/A — Not applicable: the product does not have this feature

PowerMenu

Not sure which DOS shell to use? It wouldn't hurt to try PowerMenu version 4.5 for free — as mentioned earlier, it's available as shareware. Not that you would go wrong if you bought version 5.0 in the first place — it certainly has the value to back up a purchase decision.

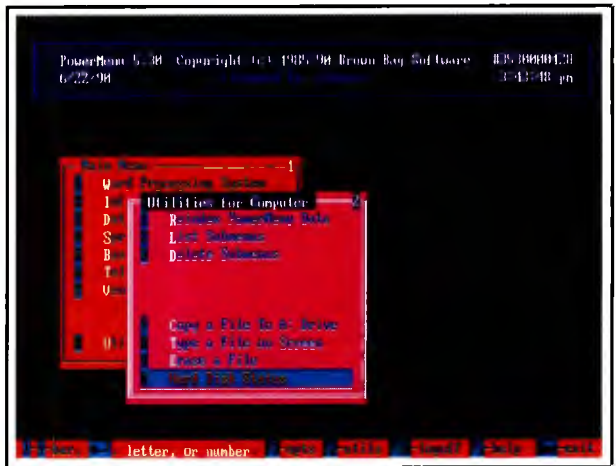
PowerMenu's feature set includes a menu maker, DOS command support, and a Directory tree-based file and disk manager. Other features are system information and status, a screen saver, and a security and usage auditing system that could sell as a standalone product.

During normal operation PowerMenu

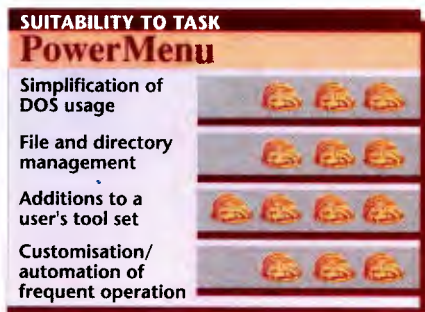
uses 20 to 120K of RAM, but when running applications it drops back to just 2.4K. A hard disk drive isn't required, but it certainly makes sense in order to get the most from this program.

Fundamentally menu software, PowerMenu gets started at the point where many others of its class stop. It searches your drive and automatically creates menu items for most popular applications. You can also manually add, edit or delete menu selections. You can store paths, start-up commands and program parameters via menu-item editing, which results in faster program startup than if you typed in the commands yourself.

The security and activity logging system can be used to control user access to individual menu items and to restrict DOS access; it can even stop users from leaving PowerMenu or changing pro-



PowerMenu uses pop-up menus extensively, like the above Utilities for the Computer menu from which some of this program's DOS operations are selected



gram colours. Of course, you'll want a supervisor to establish all other user accounts, passwords and access rights. You can save a record of all program activity in an encrypted file that only the supervisor can access. As it stands, PowerMenu isn't a network program and is licensed for just one PC; you'll need PowerMenu



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At a glance

PowerMenu, version 5.0

Distributor: Manacomm
 Telephone: (07) 368 2366
 Price: \$135
 Requires: 256K of RAM, DOS 2.0 or later. Hard disk recommended
 In short: PowerMenu 5.0 is intended for both beginners and advanced users. It has both user and program-password systems and can even track projects and hourly usage costs. This program is aptly named, and since version 4.5 is available as shareware you can try it for free.

5.5 for LANs, which costs \$1125 for 10 users. But even if you'll be the only person using PowerMenu, the logging system can track time spent on various projects

and record hourly rates for documenting project costs or client fees.

PowerMenu includes a decent but not overly impressive selection of DOS and file-management commands. If you need to issue an unsupported command you can always run a DOS command line from within the program (assuming you have access rights assigned to your user account). There's no text editor included with PowerMenu, but you can set it up to load any editor or word processor you please.

Unfortunately, the manual doesn't match the quality of the program. There are some confusing references and the explanations for a few of the program's features, such as setting up project codes and costs, are left out. There's so much power in this program it's too bad the manual isn't as good.

PowerMenu is a terrific program. It's not appropriate for beginners without help from someone more experienced to set it up, but advanced users who work with many different programs will appreciate the convenience of its stored settings that speed movement between applications. The easy access to system and file status information is another feature that will endear this program to

power users. In all, PowerMenu is worthy of recommendation.

Power Panel

SUITABILITY TO TASK

Power Panel

Simplification of DOS usage

File and directory management

Additions to a user's tool set

Customisation/automation of frequent operation

Heads will turn after you install Mouse Systems' Power Panel DOS shell and menu program. The opening screen is beautiful in colour, and the \$150 product is robust, loaded with DOS and file utilities and desktop tools. As you might expect from the vendor's name, Power Panel supports Microsoft, Mouse Systems and various other compatible mice.

Power Panel's primary function is to automatically set up menus for ap-

The DOS shell you'll find in DOS

Are you tired of having to figure out how to use DOS commands? Frustrated by the disorganisation of your hard disk? Microsoft wants to help. All releases of DOS, since version 4.0, have a built-in Shell option. Granted, this shell is not as sophisticated as any of the DOS shells evaluated here, but it is a marked improvement over the command prompt.

Microsoft has designed an SAA-compliant shell that can be operated with a mouse or function keys assigned to standard commands (F1 — help; F3 — exit; F10 — bring up menu bar). When the

Shell is invoked, user-configurable groups appear vertically on the left-hand side of the screen, while a menu bar appears horizontally at the top. Options for the file system and command prompt are also offered at startup.

With the increasing popularity of hard disks larger than 40M, and DOS now supporting partitions larger than 32M, Microsoft has sensibly included a graphical directory tree in its 'DOS DOS shell'. The file system supports point-and-shoot mouse operations that allow files to be printed, moved between directories, and

copied with ease and without you ever having to touch the keyboard.

A group of files can be tagged and modified together — a task that DOS doesn't do from the command line — and you can also view two directories simultaneously. The Shell uses icons that are similar to the ones found in Windows and OS/2 to represent executable files.

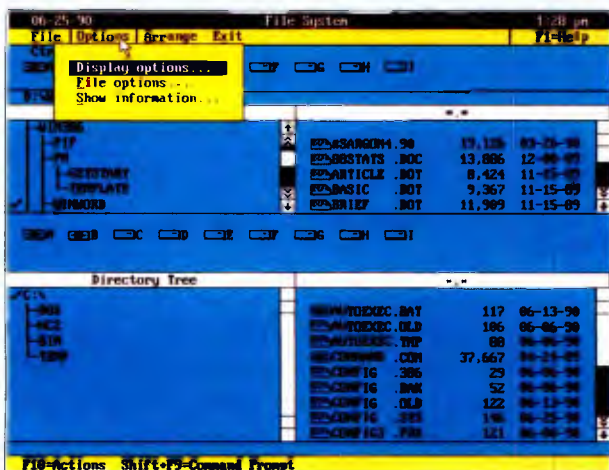
Menu groups

The Shell gives you groups of menus to choose from, a paradigm that is used widely in graphical environments. Within these menu groups, separate passwords can be assigned for different access levels. This is the first time that DOS itself has offered any kind of security.

Within the Shell, you can assign Associate files for certain file extensions. If you are a Lotus 1-2-3 user, for example, you may assign the file extension *.WK3 to 123.EXE, and by simply pointing the cursor to a .WK3 file, Lotus 1-2-3 will be invoked. The Shell allows for 20 such associations at one time.

The Shell provided with DOS 4.0 is an attempt at putting a user-friendly interface on the inscrutable operating system. If you can afford the extra 11K of memory used by the Shell and the mouse driver, you'll find that the Microsoft DOS Shell is a pleasant environment in which to work.

Abe Rosner



Not a world-beater, Microsoft's DOS Shell is an improvement over C:\>

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Power Panel divides the screen into multiple sections or panels. The display above shows Power Panel's Disk Services Panel with a Disk-level view (as opposed to a Directory level) with panel-specific function-key assignments on the bottom of the screen

proximately 600 applications. If it finds multiple applications in a category, it sets up a submenu for the category. You can also manually add, delete or edit menu items. If you set up Power Panel to start automatically, you could go for weeks or months without ever exiting to DOS. With optional password settings for menu maintenance, disk operations, DOS access, communications, and even date and time settings, you can set up computers for novice users and be reasonably sure that they won't be able to perform any functions for which they don't have valid passwords.

Power Panel's list of DOS functions is

At a glance

Power Panel, version 1.0

Distributor:	Sourceware
Telephone:	(02) 427 7999
Price:	\$150
Requires:	384K of RAM, hard disk, DOS 2.1 or later
In short:	Power Panel is a versatile program for beginners and experienced users who want to save time. It is primarily an applications menu system that also helps with DOS and file management. Desktop accessories and a telecommunications module increase this intelligently integrated program.

one of the most complete programs we evaluated, and its file and disk management services are extensive as well. However, file viewing in native formats is light in comparison to other program functions, with support for ASCII and hex files only.

All the extras

Power Panel's list of extra tools is extensive. In addition to a desktop set including a calculator, calendar and notepad, there's a communications program with telephone directories, auto-dialling and auto-logons, terminal emulation, and a telecommunications script language. You can also use the communications module with a null-modem cable for direct connection file transfer between computers at speeds of up to 115,200bps via the serial port. Other features include file encryption, macros with macro editing, and a screen saver with variable time-out settings.

For all its features, Power Panel's own system demands are, surprisingly, fairly modest. Under normal installation it needs approximately 700K of disk storage space. When you use the program, it needs at least 300K of RAM but drops back to just 94 bytes when you begin running other applications. Theoretically, you can use Power Panel on floppy disk drive systems, but the limited space available for applications would make its menus overkill.

Power Panel has broad appeal amongst its users. Advanced users who don't like menus might chafe a bit, but once you get used to the structure you can move rapidly among its features and functions. Inexperienced users set up with Power Panel by PC managers, VARs or dealers should find themselves productive more quickly than those who face cold, hard DOS on their own. Intermediate-level users can also benefit from Power Panel's relatively complete function set and utilities, and the ease with which they can get more from DOS. Overall, it's a very good program, with its gorgeous opening screen being the least of its many qualities.

Q-DOS II

Simplicity can be a virtue, and apparently it sells pretty well, too. Gazelle Systems has targeted the beginners with its

SUITABILITY TO TASK

Q-DOS II

- Simplification of DOS usage
- File and directory management
- Additions to a user's tool set
- Customisation/automation of frequent operation

straightforward \$123 Q-DOS II DOS shell and file management program. You'll find few fancy features and no power tools either — just a reasonably easy-to-use tree-based directory viewer with a single-level top-line menu of DOS commands and file functions.

Q-DOS II doesn't require a hard disk, but as is the case with all DOS shells, you'll get more from the program if you use it with multiple files and directories. When you install Q-DOS II it takes 245K of disk space, and requires a constant 128K of RAM to run.

DOS commands in Q-DOS II's repertoire include ATTRIBUTE, COPY, DEL, DIR, CD, MD, RD, TREE, MOVE, PRINT, RENAME and XCOPY. If you want to issue a different DOS command, tap the F6 key to activate the always present command line. Another function key, F2, displays date, time, current drive and file, file-sort sequence, drives available, keyboard lock-key status, installed system RAM and the amount of free RAM.

You can select the Directory function from the top-line menu to display a tree and to create, delete or move around it. There are several file-tagging options for multiple file operations including an Invert feature that changes untagged files to tagged status and vice versa. File-sorting options within directories include the standard ascending and descending sorts in order by file name, file extension, size and date. Sorts aren't permanent and you can always unsort to view things in their original order.

Q-DOS II is extremely fast. We didn't set up any performance tests for this set of reviews, but when you move between Q-DOS II functions, sort or search files, or run applications, Q-DOS II seems to snap right back with the desired action quicker than its competition.

In keeping with Q-DOS II's aim to make life easier for beginning DOS users, the 126-page manual is helpful without being overly technical. You may never need to refer to it, but if you do you'll find a no-nonsense tone that clearly explains what should happen with each function, and it often relates common problems or reasons for failure of specific functions.

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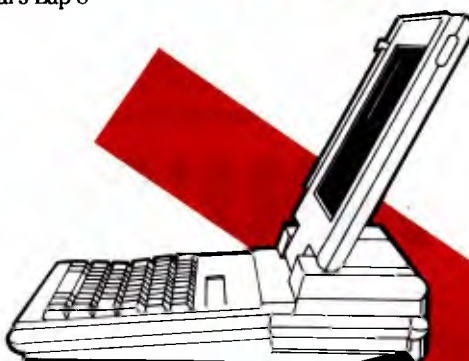
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Lotus Magellan: the ultimate DOS shell?

If you want one program that provides a shell for DOS commands, helps you navigate your disk and launches your applications, consider Lotus Magellan. While this \$225 marvel is best known for its elegant indexer, which lets you find any phrase on a typical disk in less than five seconds — branding Magellan as a text search and retrieval program — it's also part DOS shell and part menuing system.

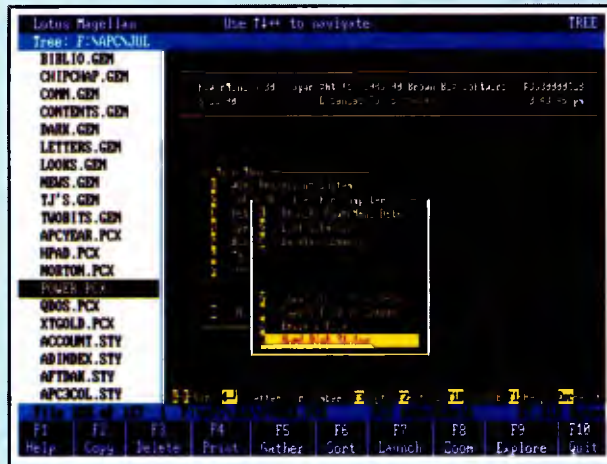
Magellan assumes that once you've located a word or phrase, you'll want to do something with the files containing those phrases. As with most DOS shells, you can group, copy, move, delete, sort, back-up or print files. There's a visual tree, of course, and Magellan lets you run (or launch) your favourite software applications from a menu.

Magellan's Viewers further distinguish Magellan from your garden-variety DOS shell. Magellan lets you view data in its native format as you browse through file lists. Your spreadsheet files appear as though Lotus 1-2-3 were loaded and your word processor files appear as if you were running WordPerfect or WordStar. This feature helps confirm that you are actually copying or deleting the right file, something most other DOS shells currently on the market just don't allow.

And if you want to run the program associated with the data file you're viewing, simply tap the F7 key for Magellan to hide itself away and then load your application. PC Tools Deluxe, The Norton Commander and others now include viewers, but Magellan remains far ahead in both quantity and quality.

While it's true that Lotus Magellan doesn't include every feature of other DOS shell and menuing systems, it's robust in so many areas that Magellan may be all you ever need.

Bill Howard



Magellan Viewers let you see a data file as if you were running the underlying program. At left, a .PCX file (actually a another screen dump) displayed graphically. Magellan also includes the core capabilities of DOS shells and menuing systems

At a glance

Q-DOS II, version 2.0

Distributor:	Sourceware
Telephone:	(02) 427 7999
Price:	\$123
Requires:	256K of RAM, DOS 2.0 or later. Hard disk highly recommended
In short:	Q-DOS II brings simplicity and clarity to DOS command execution and disk and file management. Just right for beginners.

Cluttered screen

Accepting Q-DOS II's mission to remain a simple program, there is only one criticism: its main screen. The display is crowded with file listings, a menu bar with prompts, the DOS command line, directory statistics, a function-key template and copyright information. The strategy is to prevent users from getting lost when paging through multiple displays; that's certainly fair, but this screen is too cluttered.

Gazelle's representatives describe Q-DOS II as 'lean, mean and simple' and they're right. Power users will stay away from this program because it doesn't add new functions to DOS and its speed of operation isn't enough to recommend it. Gazelle Systems won't miss the power users, however; there are plenty of others out there who are afraid to use their PCs

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Q-DOS II's attractive screen shows files on the right, a top-line command menu and directory statistics, and function-key assignments on the left. PC novices will appreciate its simplicity

and will be happy to receive the help that Q-DOS II offers.

Tree86 Plus

As its name implies, The Aldridge Company's Tree86 Plus uses the widely accepted directory-tree representation to depict drive organisation and ease movement through the directory structure. Tree86 Plus is aimed at intermediate to advanced users; its \$179 price includes a second product called Cache86, a disk cache program that also sells separately for \$136.

Tree86 is a fast program that works with or without a mouse. If you load all the supplied files, it takes up 276K of disk space; it also requires 180K of RAM unless

you load only essential files, for which it requires 124K. Tree86 uses just 8K of RAM when it launches application programs. Since it maintains directory and file information in RAM (the main reason it's so fast), the maximum RAM requirement depends on the number of drives and files it's tracking. Tree86 maintains logs for up to 26 drives with more than 16,000 files in 1000 sub-directories.

Tree86 makes some DOS-command operations simpler, though not all of the more common ones are duplicated (there's no FORMAT, for example). To issue DOS

commands not supported by Tree86 you can toggle to TreeDOS via the slash key; here you can issue all commands except those that change the computer's operational environment, such as SET, PATH and PROMPT. When TreeDOS is running it looks like a usual DOS prompt, but it also displays the time on the right side of the screen. TreeDOS isn't an implementation of the DOS alternate command processor; if you want to jump to the alternate COMMAND.COM, just hit the semicolon key from within Tree86. When you exit, you'll come back to Tree86.

Tree86 is easy to use and convenient for moving between directories. It lets you delete and move whole directories, including files and subdirectories with their files, but you can only copy one directory at a time. There are several operations you can perform with tagged files; in addition to copying, deleting and moving sets of them, you can also use tagged sets to limit text searches. Tree86's single-screen view of either directory-tree or file-list windows isn't as convenient as double-column screens, but Tree86 uses the right side of the screen to display helpful drive, file and memory statistics.

Tree86 includes a wide range of features including graphic memory mapping, a text editor, and a duplicate feature that finds files on your disk drive with duplicate filenames. There is no

SUITABILITY TO TASK

Tree86 Plus

Simplification of DOS usage

File and directory management

Additions to a user's tool set

Customisation/automation of frequent operation



macro function, scripting or menu function. The emphasis is clearly on adding power rather than greatly simplifying DOS, although a DOS command history maintains a list of the last 32 unique DOS commands issued while in TreeDOS.

Bargain caching

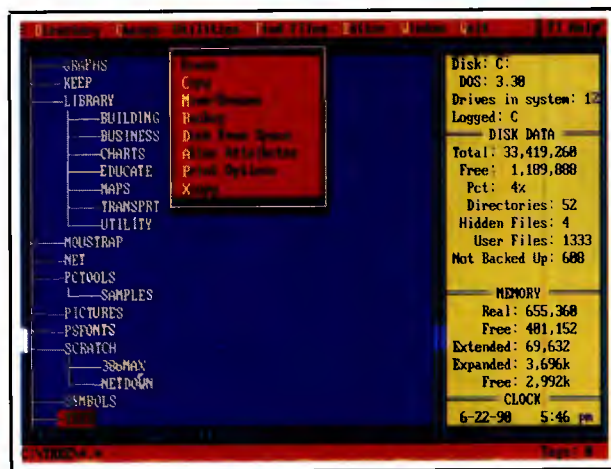
Cache86 is a bargain when included with Tree86 Plus. It's a TSR hard disk caching utility with different component programs for conventional, expanded and extended memory. It also includes a version optimised for the 386 instruction set and 32-bit bus. If you want to check on how well it's all working, a program called C86STATS displays a log of disk read requests and percentages of cache hits.

Tree86 runs other programs very well. From within Tree86's file window you point to a file with a .COM, .EXE or .BAT extension and execute the RUN option; when you leave the program you'll be back inside TreeDOS, where you're

At a glance

Tree86 Plus, version 3.2

Distributor: Data Image
Telephone: (02) 317 4511
Price: \$179; Cache86 disk caching utility, \$136
Requires: 180K of RAM, DOS 2.0 or later
In short: Tree86 Plus is heaviest on drive and file management and comes with several helpful features such as a flexible disk-caching utility, memory mapping and a DOS command history. It earns high marks as a power user's DOS shell but it's light on file format viewers.



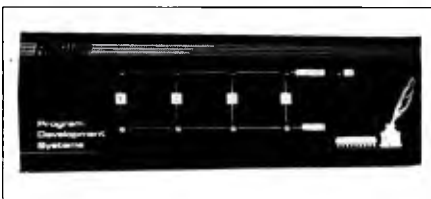
Tree86 Plus shows a directory tree or files on the left with drive and system statistics on the right. The top-line menu uses pull-down menus for options. In this screen, Tree86's Utilities menu lists DOS commands



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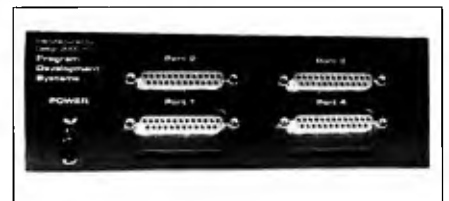
PC magazine (UK ed. Pg 64 June '89) said "...Freeway is the first file-transfer program with multitasking facilities. Its also the only program... which uses pop-up windows... Freeway lets you share a printer with a remote machine simply by popping up the Freeway window and selecting the printer option".



Your Computer Magazine (Pg. 24 Feb '90) said when awarding the Australian Hardware and Software Commendations "But the next product made our decision easy - it is commendable in both categories... Freeway offers an Australian networking solution for offices.."

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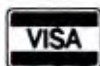
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SCREENTEST

prompted to strike any key to return to Tree86. (The only limitation is that you're not supposed to start TSR programs while in Tree86.) I tried to drive Tree86 crazy by running various programs and jumping in and out of alternate command processors, but in every case I was left where I should have been, sitting in TreeDOS, one keystroke away from Tree86.

Tree86 has file viewers for ASCII and hex files and works minimally to view some word processing format files, but this part of the program could use some beefing up.

Tree86 Plus's strongest area is DOS file management. Cache86 and the utilities and functions included in Tree86 are weighted towards experienced and knowledgeable power users who want fast action combined with convenient and flexible DOS command access.

XTree Pro Gold

Intermediate DOS users, look closely; power users already know about XTree Pro Gold's reputation and value. This DOS shell and disk and file manager for intermediate to advanced users includes an impressive list of tools and DOS enhancers gathered in a cohesive package. If you want speed, flexibility and power, XTree Pro Gold has a lot to offer.

Published by XTree, XTree Pro Gold lists for \$200. You can run XTree Pro Gold with any video setup or optionally with any Microsoft-compatible mouse, although the keyboard works just fine. When you install the program it takes 800K of disk space, though you can use as little as 68K if you delete some of the program files. When resident, the program uses almost 180K of RAM, but that number drops to just 7K when you launch or open applications.

XTree Pro Gold's main screen serves as a gateway to a variety of other screens and features. The main screen has eight components: a path identification line, a directory tree window, a files window that you can toggle between 24 and 132 file-display capability, a file-specification box where you can enter file specs or

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SUITABILITY TO TASK

XTree Pro Gold

Simplification of DOS usage

File and directory management

Additions to a user's tool set

Customisation/automation of frequent operation



wildcards for single or group file operations, the disk-specification box where you identify which one of 26 drives to reference, a statistics box with file and drive size and number data, a DOS command line, and an XTree Pro Gold prompt line at the bottom of the screen. You can display two directories and file sets on the screen at the same time and transfer files freely between them.

You can set the File Window to display all files or just tagged files in the current directory, all directories on the current drive, and all directories on all logged drives. With file tagging you can delete, copy and move any group of files in your system. XTree Pro Gold also has 'prune and graft' power to rearrange directory structure from the directory window. Another powerful file feature is the ability to search all files for specific text, though this can sometimes be time consuming as no indexes are built and files have to be searched sequentially.

XTree Pro Gold includes two file viewing choices, AutoView and View. With AutoView you can scroll through a directory list on the left of the screen and see the file contents in a large window to the right of the file list. View uses the whole screen except for the top-line path, file identification and bottom-screen prompt area. AutoView and View both use XTree Pro Gold's file viewers to show several popular application-created files in their native format. There are viewers for several word processors, dBASE and Lotus 1-2-3 files.

Program launching

You can start programs in several ways

At a glance

XTree Pro Gold, version 1.31

Distributor: Imagineering

Telephone: (02) 697 8666

Price:	\$200
--------	-------

Requires: 256K of RAM, DOS 3.1 or later

In short: XTree Pro Gold 1.31 continues its tradition of disk management excellence with a powerful set of utilities to facilitate using DOS and applications software. Best for intermediate or advanced users, this program is fairly easy to use and includes mouse support.

Editor's Choice

■ Overall: PC Tools Deluxe

■ Novice users: Power Panel

■ Power users: XTree Pro Gold

The difficulty in selecting Editor's Choice products from this group of DOS shells is compounded by the variety of programs, as well as by the specific needs of DOS users with different levels of experience.

Our overall favourite is the jam-packed PC Tools Deluxe 6.0. The new version of this multiple category, award-winning program includes new tools and features just like you'd expect, but by adding three selectable user levels, PC Tools is now as desirable for beginners as it is for expert users.

Intermediate and power users will be well served by XTree Pro Gold. Its impressive collection of disk, file and application-management features is unmatched. PowerMenu is best as a menuing program but gets honourable

mention as a DOS shell for its security system and usage audit trail for project cost tracking.

Novice users have several good alternatives. The Editor's Choice goes to Power Panel for its comprehensive set of features and great interface. Q-DOS II is praiseworthy for its dedication to simple operations for beginners.

Two other programs deserve special mention. The Norton Commander has data-transfer capabilities and other features that are good for desktop computers but especially suited for portables.

If you like the features mentioned in the evaluations but no one single program has the right mix, HyperPAD may be the best DOS-shell do-it-yourself kit yet conceived.

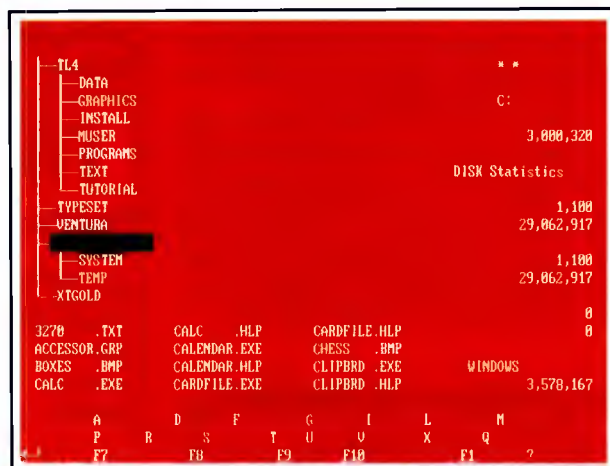
with XTree Pro Gold: by pointing to .COM, .EXE and .BAT files and executing them from the file list; setting up an Applications window as a primitive menu structure; launching and loading files for whose formats XTree Pro Gold has viewers, assuming that the application program is in your system; and finally, starting programs normally from XTree Pro Gold's ever-present DOS command line.

There are few gimmicks in XTree Pro Gold, but there are extra features. The program maintains a history of the last 15 commands issued from the DOS command line. It has a text editor, although like many DOS shells you can set it up to use your own word processor and editor instead.

XTree Pro Gold isn't appropriate for PC managers or others to set up application menus or DOS-command shells for novices — there's no macro or programming facility. You can use XTree Pro Gold's text editor to edit DOS batch files and run them from XTree Pro Gold's applications menu, but it's not simple enough for beginners, and to avoid any disastrous accidents or mishaps you probably

shouldn't put such potentially destructive tools in beginners' hands anyway.

XTree Pro Gold is fast, flexible and powerful. It's the best power user's file manager on the market and, with its additional DOS-assistance features, it's suitable for intermediate users as well. Beginners should probably stay away, since the same flexibility that intrigues intermediate users and charms experts could confuse and discourage PC newcomers.



XTree Pro Gold's main screen shows a directory tree above file listings for the highlighted directory. Disk statistics appear on the right side of the display, while the available function commands are listed on the bottom. You can also select a split screen to drop the disk statistics and display two trees and file listings

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Rodents to the rescue

Gradually, ever so gradually, the rodents have taken over. Like the Pied Piper, Microsoft has played a tune called Windows and applications have followed, lemming like, to incorporate menus, windows and mouse support. These days, a PC without a mouse is a PC with a handicap. Kester Cranswick studies the plague of mouse offerings.

The mouse should need no introduction. It is an optical or mechanical device with which a user moves an object, such as a cursor, on the screen. My computer dictionary describes it rather quaintly as a 'miniature trolley'. A mouse also has a button or buttons with which to initiate actions. Macintosh mice have one button; mice in the PC world have two or three. For a mouse to work it needs a driver — either a .COM or a .SYS file that is loaded when the system is booted — which allows software to recognise and respond to a mouse.

A good deal of modern software is written to take advantage of mice, and the advent of GEM, Windows and Presentation Manager has meant that a mouse is becoming essential. Many standard

MS-DOS applications are also written to work best with a mouse — the latest versions of WordPerfect and PC Tools, and most games are all prime examples. And of course in the Macintosh world, which was streets ahead of MS-DOS, the standard Macintosh mouse is used by every application.

Things aren't so simple in the MS-DOS world. There are hundreds of brands of mice: bus mice, serial mice, two-buttoned mice, three-buttoned mice, infra-red mice, optical mice, trackballs — enough to confuse even Mickey himself. The dozen mice and input devices reviewed here cover the gamut of available technology. They range in price from \$86 to \$700. But all have things in common.

Specifications are straightforward. The size of a mouse, how it connects to the PC and how many buttons it has are obvious. But one specification needs explanation, for it can be confusing.

Resolution in video terms is the number of dots per inch. In mice terms, resolution is by the number of 'counts' the mouse signals to the CPU for every inch of movement. The higher the resolution, the more accurate a mouse can be.

Acceleration also affects the operation of mice. The driver multiplies the resolution by a set amount to give a greater screen movement for a given mouse movement. By varying the multiplication factor with the speed of the movement, developers have engineered a ballistic effect whereby slow movements give greater control than fast movements.

When judging a mouse, resolution and acceleration should be taken into consideration. With applications such as desktop publishing, the ability to vary the sensitivity of the mouse is vital.

Mouse drivers are by now fairly standard. Most adhere to either Microsoft or Mouse Systems protocols. If the brand is not specifically mentioned when installing a foreign mouse with an application,





try a Microsoft setting. It will work nine times out of ten. Mouse drivers are terminate-and-stay-resident programs and may cause conflicts with other TSRs. While .COM drivers are more common, .SYS drivers can be useful if a .COM driver is causing problems.

Most mice come with menuing software that makes them useful with applications not written with mice in mind. The usual routine is to load the mouse menus into memory before booting the application. The mouse can then be used to move around a spreadsheet or document, call up menus and execute commands. If you use popular applications such as Lotus, dBASE and WordStar, buying a mouse with menus could really jazz up their tired old interfaces.

BMC Cordless Mouse

With a conventional mouse, the cord inevitably gets wound around objects, is not long enough, or is continually in the way. So a cordless — or tail-less — mouse is a pretty neat improvement on the original idea. The BMC Cordless Mouse, like others of its kind, use an infrared signal. The idea is not new — Apricot tried it many years ago, with limited success.

The Cordless Mouse has an IR transmitter (driven by two AAA batteries) and a separate receiver that attaches to the PC's serial port with a 1.5m cable. A red light winks when a signal is received. To conserve power, the circuitry enters a standby mode if the mouse is not used for five seconds, and switches off if there is no movement for 20 minutes. But batteries are a running cost to be born in mind.

There needs to be a line of sight between the mouse and the receiver. The signal is strong enough to operate from a distance of three metres and at a 45 degree angle from the direct line of sight.



Cursor response with the BMC Cordless Mouse seemed sluggish

On my cluttered desk, I found this latter restriction annoying.

The cursor response seemed sluggish. The mouse itself is more elongated than most and has fairly small buttons. Overall, it is unsatisfactory.

Installation is a matter of copying the files from floppy to hard disk and typing BMCMOUSE. Typing a READ.ME file shows how to configure two or three buttons, different COM ports, horizontal and vertical sensitivity and so on. On-screen help is also available.

Besides command line setting of mouse sensitivity, there is a fourth button on the left of the mouse. Pressing it while the mouse is moving gives a ballistic effect, that is, the slower the movement, the more cursor control.

For WordStar, dBASE, DOS, 1-2-3 and TurboBASIC users there are pop-up menus which can be installed via a batch file. When a menu selection is made, a distinctive squelch comes from the PC. For other applications, a program, Menu-Maker, is provided for rolling your own menus.

This mouse comes with a paint package, Visualiser, which bears more than a passing resemblance to Microsoft Paintbrush, but has unique documenta-

tion. For example, why do you make backup copies? 'Just in case World War III breaks out and your originals are nuked', reads the manual. It's a gem. Visualiser itself, however, is pretty ordinary. It looks like Paintbrush and even feels like Paintbrush. Oh well, never look a gift horse in the mouse.

If you don't like cords, a tail-less mouse is neat. It also has some good sensitivity controls. But given the sluggishness, you might like to examine a corded mouse first.

Technical specifications

BMC Cordless Mouse

Distributor:	Computer Magic
Telephone:	(07) 812 1611
Price:	\$149
Number of buttons:	Three
Size:	6 by 11.5 by 2.5cm
Maximum resolution:	400dpi
Type:	Serial
Connection:	Cordless
Software supplied:	Visualiser, MakeMenu
Accessories supplied:	9-to-25 pin converter

BMC Trackball

A trackball is still something of a novelty, particularly one as large as this device. But make it a cordless trackball and it is bound to raise eyebrows. This product has much in common with BMC's cordless mouse. Again, batteries are needed: four AA cells fit in the base of the main unit which has a ball the size of a snooker ball atop. An identical receiver is used at the PC end.

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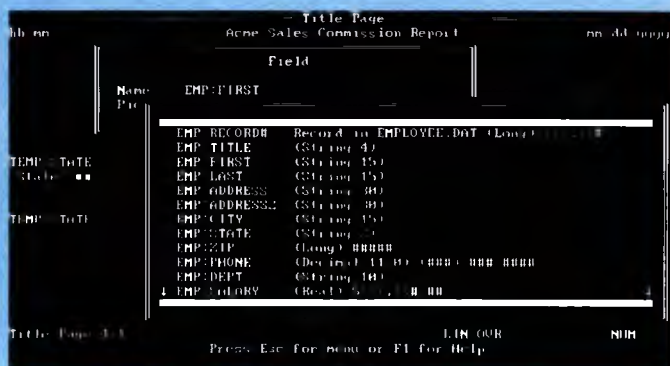
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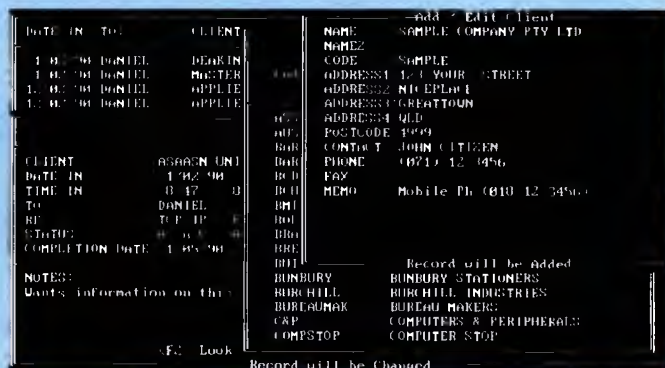
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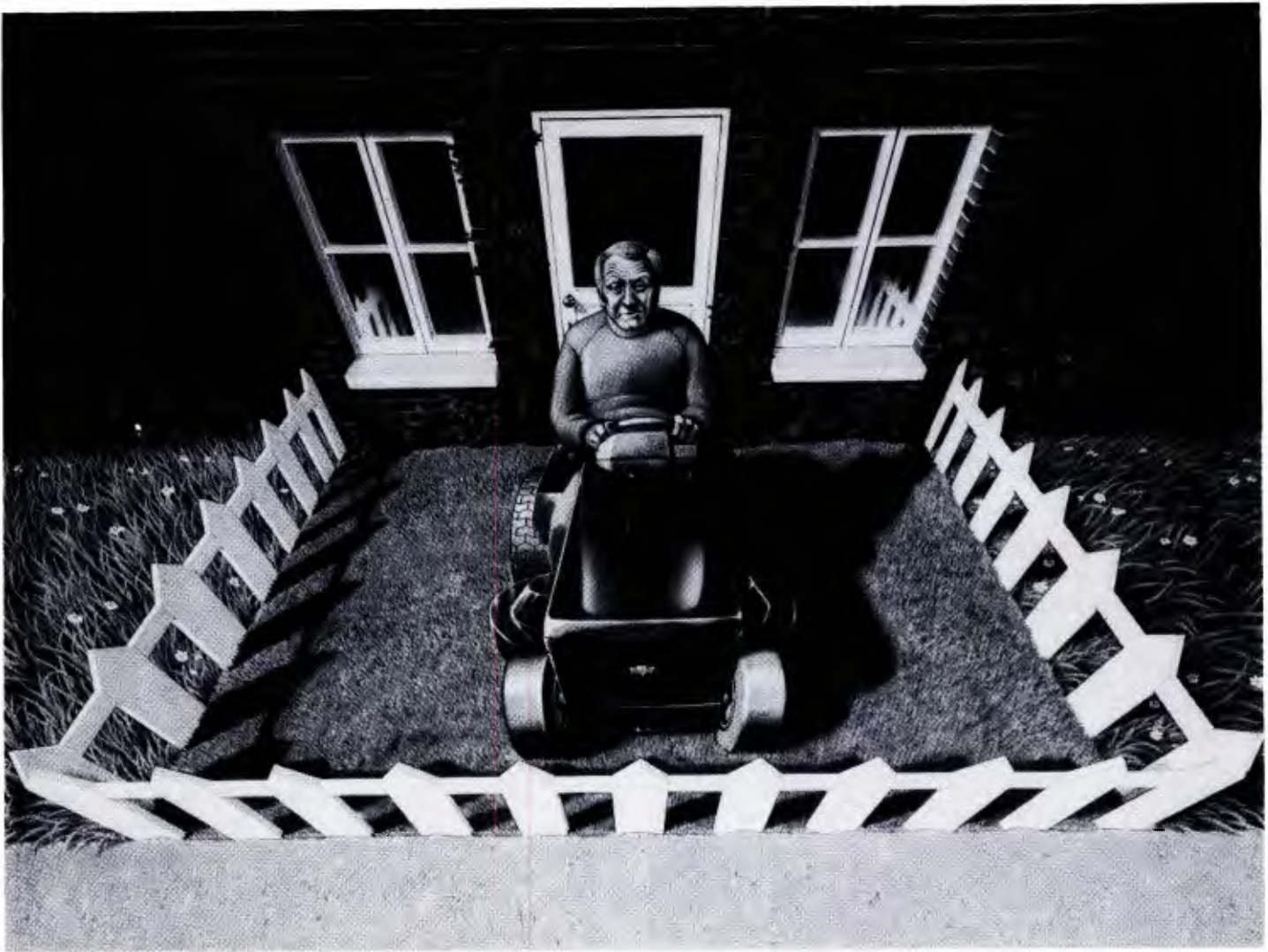
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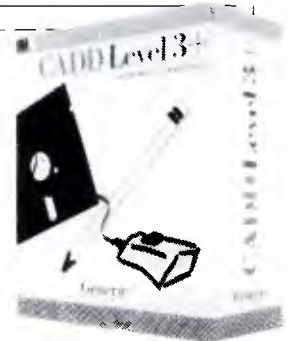
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Technical specifications

BMC Trackball

Distributor:	Computer Magic
Telephone:	(07) 812 1611
Price:	\$179
Number of buttons:	Four
Size:	12 by 15 by 8cm
Maximum resolution:	400dpi
Type:	Serial
Connection:	Cordless
Software supplied:	Visualiser, MenuMaker
Accessories supplied:	9-to-25 pin converter, batteries

power. I could use this surrogate mouse at a distance of 10 metres, making it perhaps useful in presentations which do not need keyboard input. Not many like that? Just an idea. A switch on the base of the units sets the IR power to a lower setting — the desktop setting — giving a three-metre range and longer battery life.

The same concerns about IR I had with the BMC mouse apply to this unit: response is sluggish and an obstacle in

Even better, as it doesn't have to be moved around like a mouse, this device takes only as much room on a desk as the main unit and stands tall enough to work well alongside a keyboard.

The software menuing and Visualiser supplied with the BMC Cordless Mouse is also bundled with the Trackball. A corded version of the Trackball is available for \$149.

DFI DMS-200 Mouse

This Taiwanese-built serial mouse from Diamond Flower Electric Instrument Company boasts all the buzzwords. It is opto-mechanical, Microsoft and PC Mouse Systems compatible and boasts a resolution up to 700dpi.

Installation is relatively easy. There is a .SYS file that gives Microsoft or PC Mouse compatibility, but the instructions on setting parameters are misleading. Hint: set the port parameter before the mouse type!

The parameters allow varied customisation of the mouse movement: vertical and horizontal sensitivity can be set from 5 to 700dpi (the default is 200dpi); and the resolution at different mouse movement speeds can be changed. For less studied mouse installation, there is a

.COM driver and a colourful mouse test utility.

Mechanically, the case is angular and the three buttons have a firm click. The silicon-coated ball rubs against three nylon rollers and is easy to remove for cleaning. The base of the mouse has slippery nylon feet, giving it a light, easy movement. A green mouse pad doubles as a cutting pad and there is a mouse holder that attaches to the side of the screen. When it comes to value, this one has it all.

A menuing application using a language called Menuscript comes with the



All you need from a serial mouse — the DFI DMS-200



As a standard mouse, the BMC Trackball works well

DFI mouse. It has pre-programmed menus for Lotus 1-2-3, Quattro, Visicalc, SuperCalc, Multiplan, Javelin(!), dBASE III, WordStar, Framework, Symphony, Turbo Pascal, DOS and even Novell NetWare. Bordered menus pop up in inverse video and selections can be made with any of the three buttons.

New menus can be created and compiled by any user who cares to study the manual. However, with the growing popularity of mice, many applications are coming with mouse support as standard.

the IR line of fire means no movement at all. For best results, make sure the receiver is placed off the surface of the desk.

Four buttons arc the exterior of the trackball. A rest button is provided, while the side buttons can be programmed to lock windows. Given the absence of full documentation and a software utility, this function seemed mysterious. Suffice to say it did not work on the Fuego's security system.

As a standard mouse, the Trackball works well: the ball is big enough to sit comfortably in the palm of either hand; the buttons are accessible; and sensitivity can be adjusted from the command line.

Technical specifications

DFI DMS-200 Mouse

Distributor:	MicroEducational
Telephone:	(049) 26 4122
Price:	\$165
Number of buttons:	Three
Size:	6 by 10 by 2.5cm
Maximum resolution:	700dpi
Type:	Serial
Connection:	1.75m cord
Software supplied:	Menuscript, Dr Halo Paint and Graph
Accessories supplied:	Mat, holder, 9-to-25 pin converter

More useful will be the ever popular Dr Halo Paint and Graph utilities. Paint is a rudimentary art package, featuring a virtual page larger than the screen, a TSR screen capture utility, curve fitting and fat bit editing. Graph is a business graphics application that imports Lotus, dBASE and VisiCalc files, has 18 fonts, creates 3-D charts and handles a wide range of printers. Together, they make one of the better mouse/software bundles.

The only disappointment with the DFI mouse is the poor documentation. Otherwise, it has all you need in a serial mouse.

DSE Bus Mouse

Bus mice have a major advantage over serial mice — they fit into a spare expansion slot, leaving both serial ports free. In these days of modems, fax cards and PCs



The curved mouse casing of the DSE Bus Mouse fits into the palm very well

with only two serial ports, a bus mouse is often a necessity.

Installation is simple. The 5.5 by 11.5cm 8-bit board, half the size of the Microsoft bus mouse board, has a Z-Nix

processor and little else. A jumper on the card is used to change the interrupts according to settings explained in the manual. The card fits in a free XT or AT slot and the mouse connects to the 9-pin port on the card. Install the software with the supplied utility and off you go.

The Remlig mouse is a well engineered, two-button affair. The buttons have a very light, clicky action and the mouse casing is curved to fit the palm very well. The bus attachment makes it fast to respond to hand movements.

The ball is accessed by removing a small plate. Four slippery pads make movement across the supplied small mouse/cutting pad easier. Another accessory is a mouse pocket to stick to the PC — and it has room for a pen, too!

The driver, in both .SYS and .COM varieties, is Microsoft Mouse compatible. A test utility ensures everything is working correctly; however, this mouse has nothing in the way of utility software to adjust tracking or sensitivity. This is its only shortcoming.

Software consists of pre-written menus for a number of popular applications — Lotus, WordPerfect 4.2, MS-DOS, dBASE III and Norton Utilities. A utility to build your own menus is also included. For the artistically inclined, Doctor Halo III from Media Cybernetics is supplied. It is fully documented and has both a screen grabber and a slideshow utility.

As a half-priced alternative to the Microsoft Bus Mouse, the Remlig mouse is excellent value for money. A serial version of this Taiwanese-made Remlig Super Mouse is available at \$99, but the extra \$30 for a bus version provides a far more convenient setup.

Genius GM-F303

There are two standards in the PC mouse world — Microsoft and Mouse Systems. The Genius mouse caters for both by having a sliding switch on the base that



The Genius GM F-303 feels small, and the buttons are quite clicky

sets it to either Mouse Systems or Microsoft mouse compatibility.

This simplifies installation which is a matter of connecting the cable to a serial port and copying files to a directory. The files include .COM and .SYS drivers, a mouse test utility and a menu authoring package to add menus to mouse-unfriendly applications.

The mouse driver has four sensitivity levels and can live with two serial ports, like most mice. It comes with a lifetime guarantee but the mechanism look a little on the flimsy side. In the hand, it feels small and the three buttons are quite clicky. Two silicon pads on the base help the mouse travel reasonably smoothly across the supplied mouse/cutting pad.

MenuMaker is a standard menu generation program. Files of menus and mouse actions are developed and then compiled to be used with the software. Eighteen pre-programmed menus for older applications are supplied.

The paint package, Dr Genius, is simply a rebadged Dr Halo III from Media Cybernetics. Only drivers for Genius devices, such as its graphics tablet and scanner, are supplied, and documentation is sparse. The other piece of application software, CasCAD 1, is a 2-D computer-aided design package from Cascade Graphics Systems in the US. It is quite a good introduction to CAD, though the interface is a little clumsy with the Esc key being used to toggle between graphic and command displays.

CasCAD uses graphic objects so you will need to become familiar with co-ordinate geography to use its power, but function keys can be programmed and grids set up to help.

While the Genius GM-F303 lacks the solid feel of some of the other units, it has enough included with it to offer good value for money, particularly to those wanting to dabble in CAD.

Technical specifications

DSE Mouse

Distributor:	Dick Smith Electronics
Telephone:	(02) 888 3200
Price:	\$129 (Bus); \$99 (Serial)
Number of buttons:	Two
Size:	6 by 10 by 3.5cm
Maximum resolution:	200dpi
Type:	Bus or serial
Connection:	1.75m cord
Software supplied:	Dr Halo III, MouseMenu
Accessories supplied:	Holder, cutting mat, 9-to-25 pin converter

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Technical specifications

Genius GM-F303 Mouse

Distributor:	MyLin Imports
Telephone:	(08) 356 7337
Distributor:	Advance Peripherals
Telephone:	(02) 498 2411
Price:	\$169
Number of buttons:	Three
Size:	6 by 11 by 3cm
Maximum resolution:	1050dpi
Type:	Serial
Connection:	1.75m cord
Software supplied:	CasCAD 1, Dr Genius, MenuMaker
Accessories supplied:	Mat, mouse holder, 9-to-25 pin converter, PS/2 converter

Genius 1212B Tablet

For the CAD enthusiast, a tablet is likely to be far more useful than a mouse. This Taiwanese tablet is modestly priced and comes with a standard four-button puck. An extra \$76 buys a pen-like stylus.

Installation of the tablet is far from straightforward. Overseas, the package would come with a power supply, but not so in Australia. Instead, there is an abundance of cables with various connections, and no apparent place to plug them. A call to the Sydney distributor soon put matters right. One cord goes in the PC's keyboard socket. It splits into a female socket for the keyboard cable and a power jack that plugs into the back of the RS-232 connector. That connector is a 25-pin device and you may need to buy a 25-to-9 pin converter.

The puck or stylus plugs into the rear of the tablet. Dip switches along the rear allow the pointing device to be configured as either a tablet, or a Microsoft or a Mouse Systems mouse. A mouse driver must be installed to handle this.

As a Microsoft mouse, two of the puck's four buttons equate to the left



Ideal for the CAD enthusiast: the Genius 1212B Tablet

mouse button, and the topmost key has no effect. The puck moves smoothly and is very light, making it an acceptable alternative.

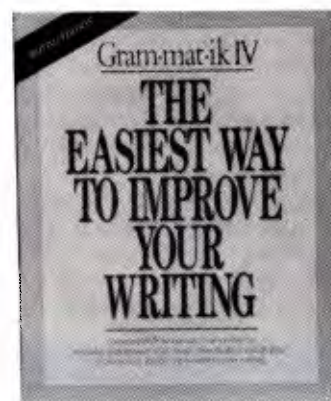
The stylus has two buttons and is, again a good mouse substitute. It does not have to touch the surface of the tablet to move the screen object and comes

Technical specifications

Genius 1212B Tablet

Distributor:	Advance Peripherals
Telephone:	(02) 498 2411
Distributor:	MyLin Imports
Telephone:	(08) 356 7337
Price:	\$699
Number of buttons:	Four
Size:	41 by 42 by 4cm
Type:	25-pin serial
Connection:	N/A
Software supplied:	Dr Genius, MenuMaker
Accessories supplied:	Stylus (\$76)

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with a holder for storage when not in use. The pen makes working with a paint program very natural. Somehow though, a mouse does not equate to a brush. The problem is that it is so light that the cursor is unlikely to stay in one spot when the pen is put down.

The large square tablet has an AutoCAD template face up. Lift a plastic cover and the template can be reversed to be a CasCAD template. Unfortunately, CasCAD is not supplied with the tablet. If it were, the package could be highly recommended to a CAD enthusiast on a tight budget. Otherwise, the software that comes with the tablet is identical to that supplied with the Genius mouse — Dr Genius and Menu-Maker. Both are well documented and useful freebies.

If your bent is CAD, or you find a mouse particularly unnatural, a tablet is an option that may be worth exploring. It's not cheap but for certain types of applications, a tablet has no equal.

IBM PS/2 Mouse

Any user of a PS/2 microcomputer will be familiar with the Big Blue mouse. It is a version of the two-buttoned Microsoft serial mouse, but with an IBM price tag.

The mouse is beautifully manufactured in a Japanese factory. For example, the mouse rollers are close to a centimetre wide, so they make direct contact with the rubber ball. The twin buttons, standing proud on the top of the mouse, have a rock solid feel. The extra long cable ends in a 6-pin DIN connector, fitting a socket in PS/2 micros. It won't fit into a standard RS-232 port.

Software comes on a 3.5in disk. An installation utility copies the .COM driver to the root directory, which must be invoked by a batch file or from the DOS prompt.

In use, the IBM mouse is excellent. The silicon pads on the bottom make it slide



High price, good quality: the IBM PS/2 Mouse

Technical specifications

IBM PS/2 Mouse

Distributor:	IBM Australia
Telephone:	(02) 634 9111
Price:	\$212
Number of buttons:	Two
Size:	6 by 11 by 3cm
Maximum resolution:	Not supplied
Type:	6-pin Serial
Connection:	2.8m cord
Software supplied:	None
Accessories supplied:	None

quickly, while the weight of the mouse means it isn't accidentally moved.

No additional software is supplied — what you see is what you get. Value for money compared with the opposition must be rated as poor, but if it's quality you want, here's where to find it.

Logitech Trackman High Resolution Stationary Mouse

A trackball is ideal when space is at a premium. While this device is smaller than the BMC trackball, it has a little more versatility — and a much higher price. Software is supplied on both 5.25in and 3.5in disks, which is unusual in this group and a sign that we are dealing with a company that has thought carefully about customers' needs. Logitech also provides an install utility that makes software installation a breeze. It copies drivers, installs selected application menus and automatically creates a batch file.

The Trackball is an unusual design in that the ball is off-centre and smaller than you might expect. It is designed to be moved by the thumb rather than the palm, with the fingers clicking the three buttons.



The ball on the Logitech Trackman is off-centre and smaller than you might expect

To change the orientation of the trackball, or to change from left to right-hand usage, type MOUSE and a direction at the system prompt. This determines which way of rotating the ball is translated as up. This is a handy feature, for not all hands work quite the same way. Another option in the setup process reverses the left and right buttons.

Logitech has engineered some smart ideas into its pointing devices. For instance, it has variable ballistics so it can

Technical specifications

Logitech Trackman High Resolution Stationary Mouse

Distributor:	BJE Enterprises
Telephone:	(02) 858 5611
Price:	\$213.40 (Serial) ; \$288.40 (Bus)
Number of buttons:	Three
Size:	13.5 by 11 by 4cm
Maximum resolution:	15,000dpi
Type:	Serial
Connection:	2.7m cable
Software supplied:	LogiMenu, Mouse-2-3 shell
Accessories supplied:	9-to-25 pin converter

HALO Paint, HALO Graph, Mouse Pad, Mouse Holder, DFI DMS-200 Mouse.

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The DFI DMS-200 Mouse

Specifications

Model Number	DMS 200
Compatibility	Microsoft & Mouse Systems mouse
Weight	180 grams
Resolution	200 dpi
Technology	Opto-mechanical
Ball	Silicon-rubber coated ball
Cable length	180 cm
Connector type	Either DB9 or DB25
Interface	RS-232C

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be set up to give more or less control over the cursor at slow movement speeds. Sensitivity to movement can also be set on a scale of zero to 10. These options can be changed by calling up a TSR control panel and can dramatically improve usability. Resolution is from 50 to an incredible 15,000dpi.

The useful mouse menus cover 24 applications, including WordPerfect, XTree, Quattro and Paradox. Other menus can be written with a utility called LogiMenu. Mouse-2-3 is a Lotus 1-2-3 shell that provides an excellent interface to the venerable spreadsheet. Pop-up menus almost obviate the need for traditional Lotus menus . . . if you are a Lotus user, give it a go.

A bus version of the Trackman is available for \$228.50. Both offer a sensible alternative to mice if desk space is at a premium. But they are likely to appeal most to laptop users. Use one of these little devices and watch those laptop applications come alive.

Microsoft Mouse

Of all the mice in this group, this is the best selling, the most popular and the standard. It is available in both bus and serial versions, with no difference in price. I prefer the bus version as it leaves all serial ports free.

The bus card is a 10 by 12.5cm short card that fits in any 8-bit slot. It has three jumpers: one sets the interrupt; another specifies an 8 or 16-bit slot; and the third specifies whether the card is the primary or secondary Inport controller. Other than that there is just a Microsoft processor and a few resistors.

The port is 9-pin mini-DIN equivalent to a standard RS-232C. The mouse has a commendably long cable and is not difficult to install. Mechanically it is a fine device. One of the two buttons is wider than the other; a sensible design feature



The Microsoft Mouse is bundled with Windows 3.0

Technical specifications

Microsoft Mouse

Distributor:	Microsoft
Telephone:	(02) 452 0288
Price:	\$295 (Bus or serial)
Number of buttons:	Two
Size:	5.5 by 11 by 3cm
Maximum resolution:	400dpi
Type:	Serial
Connection:	2.5m cable
Software supplied:	Microsoft Paintbrush, Mouse Menus
Accessories supplied:	None

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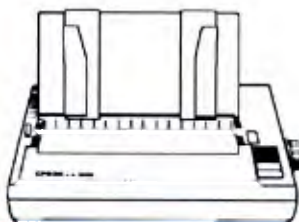
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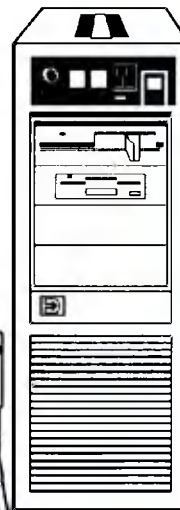
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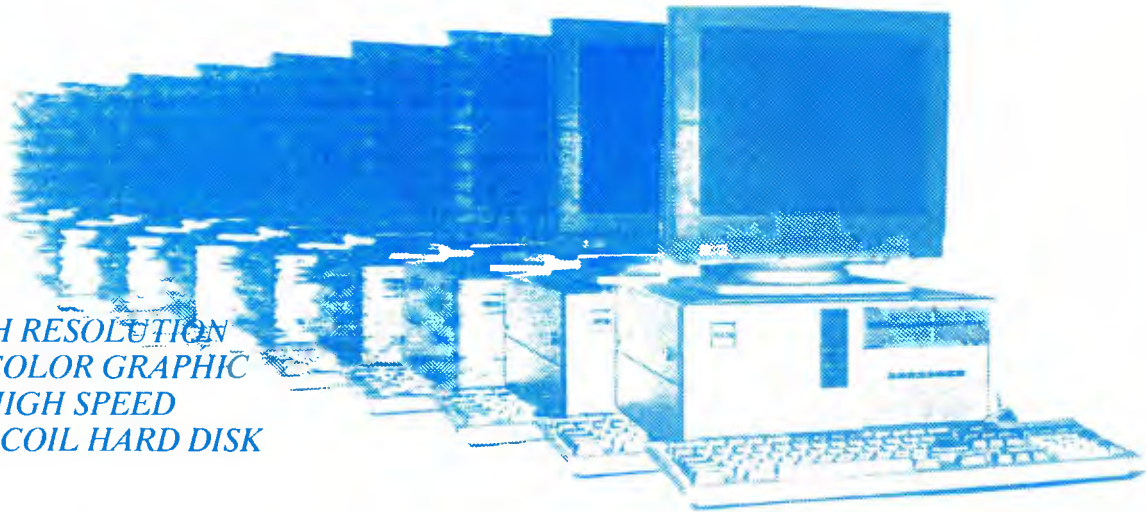
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since many applications only need one mouse button. Inside, the metal rollers are as wide as the case allows. In the hand, the small size and rounded lines make the Microsoft mouse very comfortable.

Four 5.25in and two 3.5in disks are supplied. Dual media is a thoughtful touch. Instead of a mouse test utility, there is a snakes game.

All mouse sensitivity adjustments are made with a TSR utility called CPANEL. Sensitivity can be adjusted over a five to 100 range and there are four sensitivity profiles; others can be created.

Beside the .COM and .SYS drivers, there is a wide range of menus for Lotus 1-2-3 (right up to Release 3.0), Symphony 2.0, dBASE III Plus, WordStar 5.0 and 5.5, MultiMate Advantage II, WordPerfect 4.2 and 5.0, SuperCalc 4.0, PFS: Plan and File, and Professional Write. It is a good range of menus that work well, particularly if the right sensitivity profiles are used.

More appealing is Microsoft Paintbrush, a graphics application that will be familiar to any Windows user. The .PCX format files can be read into a wide range of applications.

While the Microsoft Mouse may not be the cheapest buy, for most people it will be the safest. But the best reason to go with this device might be a \$400 bundle of the Microsoft Mouse with Windows 3.0.

MSC PC Mouse II

If Microsoft is one standard in the mouse world, Mouse Systems is the other. The company has patented its mouse opto-mechanical mechanism and used it in a range of two and three-buttoned mice.

The mouse mechanism has no moving parts. Instead, an infrared light source is shone onto a shiny mouse mat. Its reflection is picked up by a sensor which signals the mouse movement. The advantage is that surprisingly little movement is needed for the mouse to cover



The MSC PC Mouse II: a good alternative to Microsoft's offering

the screen. Less maintenance is required too.

This is a first-class product: the mouse itself is angular; the twin buttons are positive and have a light action; and it moves smoothly on the pad (there are others, however, with a smoother sliding action).

Installation is a breeze and there is an easy-to-use test to make sure the job was done correctly. Resolution can be varied over 10 levels from 20 to 6400dpi. The responsiveness can be altered on the fly by pressing Ctrl, Alt and the left mouse button, then a number from 0 to 9. An acceleration parameter can also be included when the mouse driver is invoked.

The utility software includes Designer DOS, a workable DOS shell that gives a character-based interface to the DOS environment. A menu of applications can be constructed, files can be sorted in various ways and attributes can be changed. It is not PC Tools, but it is handy to have. Allied to these are menus for individual applications such as 1-2-3, Quattro, SuperCalc 3, Multiplan, dBASE, Q&A, R:BASE, Paradox, Framework, Symphony, Javelin, TimeLine, PFS:

Technical specifications

MSC PC Mouse II

Distributor:	Dick Smith Electronics
Telephone:	(02) 888 3200
Price:	\$229 (Serial); \$249 (Bus)
Number of buttons:	Two
Size:	6.5 by 11 by 2.5cm
Maximum resolution:	6400dpi
Type:	Serial
Connection:	2.7m cord
Software supplied:	PC Paint Plus, 1-2-Click, Designer DOS
Accessories supplied:	Optical mat, 9-to-25 pin converter

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Professional Write, WordPerfect 4.2 and 5.0, four WordStars, Turbo Pascal and MS-DOS. An application called POPUP invokes these menus, but they don't work in EGA or VGA modes of applications.

1-2-Click is a Lotus-specific mouse interface that really enhances spreadsheet operation. The other major application is PC Paint Plus. This is on a par with Microsoft Paintbrush, and comes with a small gallery of clip art, a screen capture utility and five fonts. It is easy to use, has all the paint features you could want and drives a large range of output devices.

At \$229 (a bus version costs \$249), the Mouse Systems mouse is an alternative to the Microsoft offering. It is well built, has the right software and the optoelectronic mechanism means less desk space is needed.

PowerMouse 100

Now this is a mouse that roars. It has no fewer than 40 programmable buttons and is an extraordinary piece of technology. Installation is a breeze. Plug it into a serial port, run the install program and nominate which set of menus you want the system to boot with. Then load up your favourite application.

The PowerMouse comes with pre-written menus for MS-DOS, Lotus 1-2-3, Excel, SuperCalc 4, Quattro and Quattro Pro, Lucid, Symphony, Quattro, Volkswriter, Microsoft Word, WordStar 5.5, WordPerfect 5.0 and 5.1 and PlanPerfect. Menus are installed by typing POWER and the menu name. The driver is memory resident, taking up 16K of RAM.

The key to this mouse is its programmability. The 40 keys give you a numeric keypad (great for laptops), 10 function keys, and up to 240 programmable key combinations, using Fn, User, Shift, Ctrl



The PowerMouse 100: not for the average mouse user

Technical specifications	
PowerMouse 100	
Distributor:	MiLyn Imports
Telephone:	(08) 356 7337
Price:	\$495
Number of buttons:	40
Size:	7.5 by 16.5 by 3.5cm
Maximum resolution:	200dpi
Type:	Serial
Connection:	1.8m cord
Software supplied:	Menu editor
Accessories supplied:	9-to-25 pin converter

and Alt keys. Up to 255 characters can be assigned to a single key combination, opening up the world of macros.

Ten keys beneath the two 'conventional' mouse buttons are labelled Copy, Move, Sum, \$, Erase, Title, Window, Row, Col and Width. Yes, they do what you might expect in word processors or spreadsheets and can be used instead of menu or keyboard commands. SUMming is as simple as positioning on

‘With prolonged use they become covered with dirt and must be cleaned. Grotty rollers will make a mouse stuttery and imprecise in its action.’

the first cell, pushing the Sum button and dragging over the cells to be added. The developer claims PowerMouse will reduce keystrokes by a factor of ten. Certainly if you get to know the product, you will be using the keyboard less.

A powerful editor that runs either TSR or as a standalone application allows for the creation of new menus, but this is not something inexperienced users would want to try.

As a straight mouse, the PowerMouse is cumbersome. Its size and weight make it difficult to move rapidly and its resolution is only 200dpi. The main buttons are sometimes difficult to find unless you adopt an unnatural hand position. You also need to have a menu installed; if you don't, the cursor will move too fast to be controlled. But there are users who will find the PowerMouse a great asset.

Spreadsheet users could almost operate without a keyboard; laptop users will gain a numeric keypad; and those who have to use many different applications could find the PowerMouse a means of standardising commands.

At \$495, this is a hell of a mouse. It is not for everyone — the price sees to that — but if you can persuade the boss you need one, you won't be disappointed.

Truemouse TX3000 Deluxe Mouse

This inexpensive mouse offers fabulous value for money. It includes a mouse holder with room for a pen or two, a mouse mat doubling as a cutting mat and a paint program. The mouse is broad and flat. The ball is held in place by an easily removed plate, and four silicon pads make for smooth mouse movement. But while it works well, it lacks the solid feel of some of the other mice.



The Truemouse: software and documentation let down what is otherwise an excellent value-for-money offering

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Technical specifications

Truemouse TX3000 Deluxe Mouse

Distributor:	Diamond Technology Products
Telephone:	(02) 667 4068
Price:	\$86
Number of buttons:	Three
Size:	6.5 by 11 by 3.5cm
Maximum resolution:	1200dpi
Type:	Serial
Connection:	1.7m cord
Software supplied:	Image 72, MakeMenu
Accessories supplied:	Mat, holder, 9-to-25 pin converter

Installation involves plugging the cable into the serial port and copying the driver files to a subdirectory. A setup utility is used to change from Microsoft to Mouse Systems compatibility, or to change resolutions over a range of 50 to 1200dpi. The default resolution is 200dpi.

Software quality leaves a little to be desired. The mouse test program would not run and bad disk sectors prevented all files being copied. Documentation was extremely sparse and poorly written. Menus for 14 standard applications (including 1-2-3, Multiplan, Visicalc, WordPerfect, WordStar, dBASE, Framework, PC Tools, Symphony and MS-DOS) are supplied, but there are no printed details on how to use them. Instead, there are some text files on disk.

New menus can be authored with a utility called MakeMenu. As with other

such utilities, text files defining menus and mouse actions are created and then compiled to be run with the appropriate application.

Image 72, the paint program, is a much better effort. It is a surprisingly versatile program, able to accept scanner input and run in either colour or mono modes. Menus at the side and bottom of the display area are fairly self explanatory. Files can be saved in .PCX, .TIF and other popular formats, making it a useful program.

While there are criticisms of the software, given the asking price for this mouse it represents exceptional value for money.

Recommendations

Which of these devices is most suitable

Cleaning your mouse

Maintaining mice is a matter of keeping them clean. Mouse balls (cut the smut, now) should be cleaned by washing them in warm, soapy water and dried well. The mouse casing can be wiped with a damp cloth. Also pay attention to the rollers inside the ball socket. With prolonged use they become covered with dirt and must be cleaned. Grotty rollers will make a mouse stutter and imprecise in its action.

The best way to keep mice clean is to use a mouse mat. Many mice come with their own mat, often doubling as a cutting mat. An ideal mat should let the mouse slide smoothly across its surface, should not be too high off the desk and should not generate static electricity.

The Australian-made 28 by 21 cm mat from DSC Management is ideal. Costing \$24.90, it has a slightly raised lip so you know when you reach the edge, a non-slip surface and, aside from a slight rubbery smell, is unobtrusive and effective. An optional extra is an earth to ground it and remove all static electricity.

for you depends on your needs, but a few generalisations can be made. If your PC has only two serial ports and you anticipate needing both for other peripherals, go for a bus mouse. Of those, the DSE is excellent value for money, but Microsoft has a better product if you can afford it.

Laptop users should consider a trackball — the BMC if money is tight or the Logitech for its better software. The PowerMouse, though pricey, is also worth a look.

For the rest, skip infrared mice and go for mice with tails. The Truemouse is being practically given away at \$86. The \$229 PC Mouse has excellent utility software and is a solid product, while the \$165 DFI mouse has good graphics software and a more appealing price. At a similar price, the Genius mouse is better for those curious about CAD. If you are really curious about CAD, a tablet such as the Genius 1212B is going to be more useful than a mere mouse.

Best buy? The Truemouse. But the best mouse award would go Microsoft's way. A bus mouse with Windows 3.0 at \$400 opens up a whole new world of personal computing.

END

Kester Cranswick is a director of a Melbourne-based computer consultancy, Point Partners. He can be reached on (03) 578 2745.

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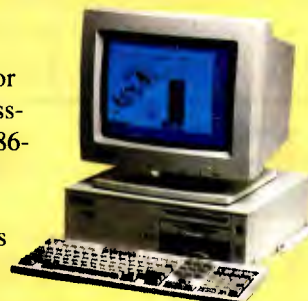
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The super servers

This story is about a brand new breed of computers, a breed that has emerged because the hunger for vast technological improvements in the business-place is so great. PC technology is quickly evolving from simply bringing us ever-more-powerful desktop systems to generating what will probably be the most important computers arriving on the market during the next decade.

The Intel family of microprocessors, the XT and AT (ISA) bus standards, the newer MCA and EISA buses, and DOS itself have enabled users of virtually any hardware vendor's PC to operate any software vendor's PC program without difficulty. Most of the software in this PC technology chain has been upwardly compatible, which means that users can have ever more potent computers do the same work more effectively.

But a new impetus for growth in PC-based computing power comes from the increasing popularity of LANs and the emergence of server-based applications technology. Those twin developments have brought system demands that require LAN servers to perform in ways that simple boosts in PC processor power won't accommodate. Mainframes and minicomputers could provide the processing muscle, but it's far more attractive if PC-compatible processing technology is used at both server and workstation ends of the LAN. As a result, new approaches to providing standardised PC computing are emerging, and the computers that have entered the fray are as different as they are the same.

The common route taken by designers of the Compaq Systempro, the Mitac Series 500 and the NetFrame NF100 — all examined here — is to build high-capability server technology by using multiple Intel processors surrounded by high-performance, largely standard parts. Compaq's offering is available now, while the Mitac Series 500 will not be available until the third quarter of this year. NetFrame is currently negotiating Australian distributorship and also hopes to be shipping its products by the third quarter. [Watch Newsprint for distributor details — Ed.] Each system is based on Intel's 80386 microprocessor, and two are designed to

use Intel 80486 chips as well. Two of the three use I/O buses generally accepted as PC industry standards, and each is capable of running operating system software commonly accepted as standard throughout the computer industry.

Yet none of these machines resembles a standard PC except in vague ways. While they're designed to deliver standard PC computing power, they do so through new and more powerful hardware mechanisms. Each is assembled differently from most PCs and they are assembled differently from each other. They are also designed to use somewhat different software technology.

Compaq, Mitac and NetFrame are leaders in multi-processing LAN file servers. Are these systems PCs or minicomputers? John Dickinson finds that when you look at their performance, categories don't seem so important.

Multiple processing

Multiple CPUs have been used in computers since the early 1960s. More often than not, such computers have used only



two processors. While there are several ways to design computers that use multiple processors, these machines are always built to share RAM and to control common system resources like disk drives, communications facilities and printers.

The earliest multiple-processor adaptations were planned around entirely separate computers — usually mainframe units — that were coupled together using their I/O buses. Built before the days of the multi-tasking CPU, these machines were designed to increase system throughput by allocating low-speed work — such as reading data from cards and printing reports — to low-speed computers. That meant that higher-speed (and more expensive) computers could dedicate themselves to lots of computationally intensive jobs at the same time the low-speed chores were taking place.

Designs using separate computers or processors that are far apart (electronically or physically) are called loosely coupled. Loosely coupled designs are still used in multiple-processor systems, but many newer schemes incorporate a closely coupled strategy. (The systems we review here fall into this category.) The processors in a closely coupled system generally communicate through the system's main RAM. Such a design is more difficult to build because it requires processors with enough intelligence to observe rules involving protected-memory areas, as well as memory interfaces that enforce those rules. The memory protection prevents one processor from corrupting data in memory being used by another processor in the system.

The differences between loosely coupled and closely coupled designs have more to do with operational speed than anything else. Clearly, the farther two processors are from each other, the longer it takes for data to travel between them and between commonly used resources. Sharing resources in this way is also electronically clumsy, because communication through I/O channels tends to be relatively slow. Thus, closely coupled designs are generally faster than loosely coupled ones.

Two processing models

What's more important than the connection technology is the role that each CPU plays in a multiple-processor system. There are two basic models: symmetric and asymmetric processing. Symmetric processing generally requires that each CPU has an equal share in the computer's operation, and that each has the opportunity to do the same job at

about the same time and to provide the same performance level to the entire system. The asymmetric processing model assigns different roles to each processor in the system, providing each CPU with the opportunity to maximise its service contribution in a particular area. Both models are used by the systems covered here. As you can see in the

•The evaluations are worth your close attention, as they should provide plenty of food for thought when it comes time to make your next LAN server decision. •

diagram 'Sharing system memory', there are variations of and advantages to each scheme.

How software fits in

Asymmetric or symmetric processing can be implemented in hardware, software or both. If the system itself is designed to be completely symmetric and to give all processors equal access to all components of the system, any sort of symmetric or asymmetric system can be implemented in software. If the designers have developed processors that are tied to particular components, then only asymmetric systems can be implemented in software.

While almost any operating system can be configured to take advantage of a high-performance multi-processor system, such units are designed for multi-user network systems, not single-user applications. The size of LANs is increasing rapidly and, even before the first server-based application is implemented, more server processing power is being used every day to service more workstations. (That's especially true of the NetFrame design, where you can service more users on the same box by adding an I/O processor). It's no surprise, then, that major LAN operating systems, including Novell's NetWare 386, Microsoft's LAN Manager 2.0 and Banyan's VINES, are candidates for operating these computers (see 'LAN operating systems: the power behind the server' in last month's LAN feature).

Of course, we can't overlook another player in the high-performance systems

software sweepstakes: Unix. AT&T's ubiquitous time-sharing system has long been promoted as an important operating system for the PC's future. Its ability to handle multi-processor environments may help it move closer to the limelight, especially when the Hewlett-Packard/SCO extensions that make a Unix host look like a LAN Manager file server become more widely available.

What to look for

New performance pressure on LAN servers is clearly pushing us towards technologies that provide previously unheard-of service levels. Multi-processor technology seems to be the route of choice — and the three machines reviewed here are the first steps into this new world.

But remember that this technology is new and different, and while many PC-industry standards are used in these designs, so far there is nothing resembling a multi-processing standard. These vendors lead in establishing that standard, but since more multi-processing design options are still under development, it's way too early to call a winner in this arena.

Meanwhile, server-based applications are barely available, and it won't be clear for a while yet what hardware/software combination will yield the best results. Besides, except for the NetFrame version of NetWare 386, production versions of operating system software are not yet available.

The benchmark test results reported in 'LAN operating systems: the power behind the server' will give you some insight into the speed of the three machines covered here. You should exercise caution when evaluating those numbers, however, because the state of the software makes their value uncertain. For example, when NetWare 386 runs on the Compaq Systempro, it takes advantage of only one processor, while on the NetFrame it uses two. Consistent results simply aren't available.

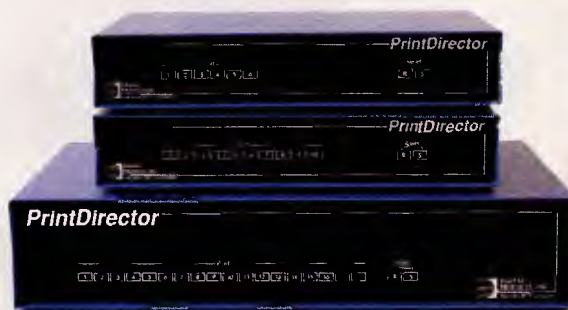
What is available is a run-down of each machine's interesting features, and information on how each one operates. Note that the Compaq Systempro and NetFrame computers we examined were final production units; the Mitac we saw was still in the prototype stage. The evaluations are worth your close attention, as they should provide plenty of food for thought when it comes time to make your next LAN server decision.

Mitac Series 500

The Mitac Series 500 looks like the odd progeny of a modern minicomputer

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How parallel processors share system memory

The symmetric approach

The symmetric approach to multiple-processor systems requires that each processor has an equal role and be able to process any system requirement, regardless of whether it is for CPU-bound program processing or input/output. The model requires open access to all parts of the system and is best implemented when all processors in the unit have equal capacity. The Compaq Systempro and Mitac Series 500 both are symmetric in design.

In a purely symmetric system, tasks are allocated equally. After finishing one task, the processor picks up the next one the operating system has queued and executes it.

Some systems are based on the concept of 'master' and 'slave' processors, in which the master tries to optimise the use of each processor by distributing the task load according to some predefined allocation scheme. The farther this allocation scheme takes the processors from an equal footing, the closer the system comes to being asymmetric.

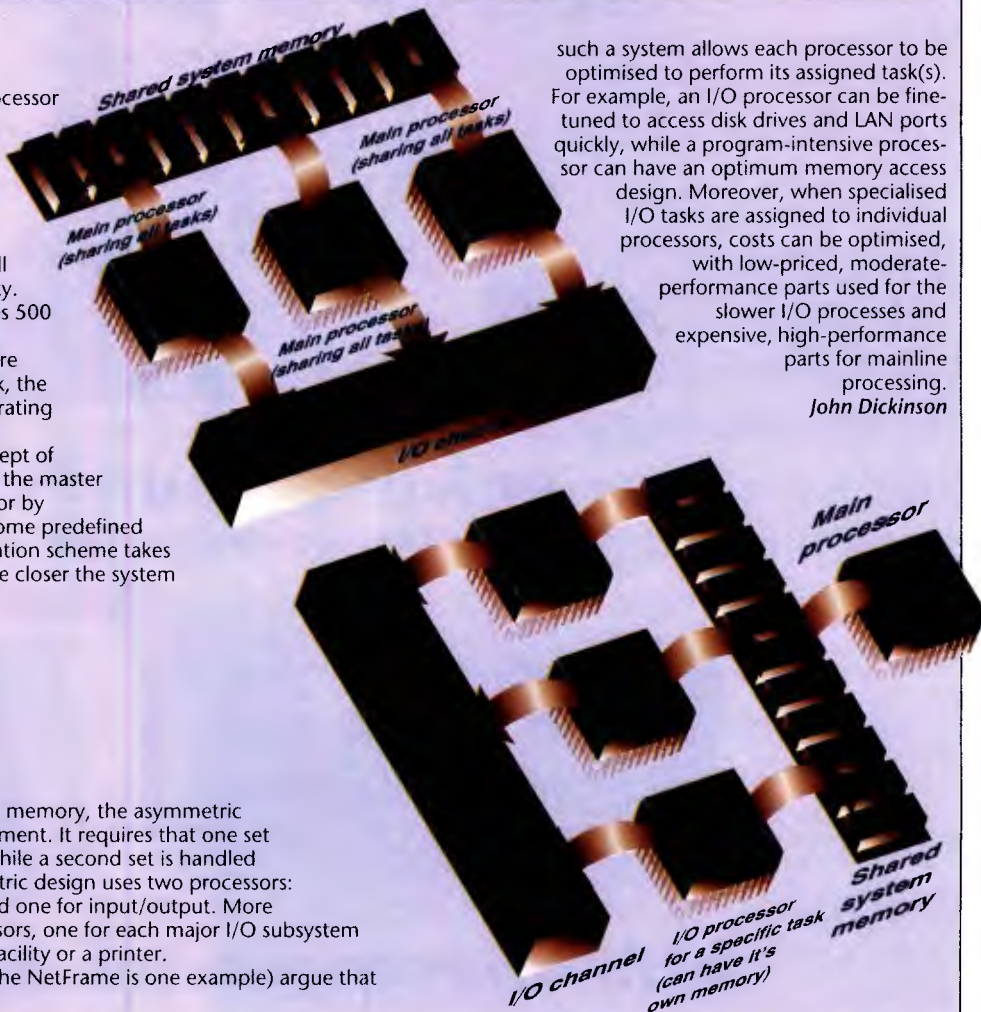
The asymmetric approach

Of the two approaches to shared system memory, the asymmetric model is easier to understand and implement. It requires that one set of tasks be executed by one processor while a second set is handled by another. The most common asymmetric design uses two processors: one for mainline program processing and one for input/output. More elaborate designs use several I/O processors, one for each major I/O subsystem such as a disk drive, a communications facility or a printer.

Proponents of asymmetric systems (the NetFrame is one example) argue that

such a system allows each processor to be optimised to perform its assigned task(s). For example, an I/O processor can be fine-tuned to access disk drives and LAN ports quickly, while a program-intensive processor can have an optimum memory access design. Moreover, when specialised I/O tasks are assigned to individual processors, costs can be optimised, with low-priced, moderate-performance parts used for the slower I/O processes and expensive, high-performance parts for mainline processing.

John Dickinson



mated with an art-deco-style table radio from the 1920s. Perhaps that's because it contains an odd combination of old and new technology, or this might reflect its joint US/Taiwanese engineering heritage.

The Series 500 system (which was delivered in prototype form) owes much of its multi-processor electronics design to Corollary, a California-based company that provides engineering products to OEMs like American Mitac. Corollary designed the basic, mostly symmetric multi-processor architecture, and Mitac engineers adapted it to the computer.

Like the Compaq Systempro, the Series 500 contains two buses: one (the 'C-bus') for processor and shared memory communication; and the other for I/O. Unlike the Compaq, the Series 500 has an I/O bus that was the older-style AT (ISA) architecture, rather than the newer, bus-mastering EISA design. The processors include at least two 25MHz 80386s; the system can support a total of seven. A main 386 controls the

system and basic I/O, including the SCSI disk drive. Additional processors are used for mainline processing as well as for controlling serial communications.

The base system board in the Series 500 contains, besides the main 386, a socket for an optional 80387 numeric coprocessor, a 64K static RAM cache operated by a custom write-back cache controller, and bus controllers for both the AT bus and the memory/processor bus. Also on the main board is the SCSI interface used for disk and tape drives, along with the keyboard and video controller for the main system console.

Each additional processor is mounted on a special board called the 386/SIO card. SIO stands for 'serial input/output'; besides supporting mainline processing, the 386s on these boards maintain communication with anyone logged-in to Unix using standard ASCII terminals attached to the Series 500. Each SIO port can support up to four 8-port terminal concentrators, which means that each 386/SIO card can support up to 32 users.

At least one 386/SIO card must be installed in the Series 500. Such a card also includes a socket for an 80387, and the same customised write-back cache controller (operating a 64K static RAM cache) that is installed on the base system board.

Data mapping and cache coherency

The Mitac supports 8 to 64M of RAM, housed on expansion cards of up to 16M apiece. The memory design includes self-correcting logic for single-bit errors, but it is complicated both by the presence of the AT bus and by the write-back cache associated with each processor in the system. The AT design causes addressing to be complex, while the write-back cache presents a cache coherency problem, which is handled through the Mitac's intelligent C-bus.

The first 16M of memory is called the AT-bus View. The first 1M includes space for standard system ROM, which is used for BIOS, and memory space for I/O



Caution: Most local area networks gobble up huge amounts of RAM

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devices using the AT bus, which require the use of low memory addresses for buffer areas. The area from 1 to 8M can be used either for I/O devices or for the memory mapping described below. The I/O device area is visible only to the main system processor, which has exclusive access to the AT bus.

Memory addresses from 8 to 16M must be used for mapping data acquired through the AT bus into the high-memory space available to the rest of the system. Data acquired from the SCSI disk, for example, is placed in buffers located here by the main processor, and is acquired from here by other processors; from the mapping space, data can be moved to anywhere else in the 64M address space.

The C-bus architecture is designed to maintain cache coherency in the presence of multiple processors using individual high-performance write-back caches. When only one processor is used in a system with a write-back cache, the cache controller is responsible for maintaining current data; whenever the processor writes to memory, the data goes into the cache, and the controller decides when it needs to unload the data back into main system memory. When a

write-back cache is used in a multi-processor system, it is possible for one processor to need data whose current value is in the cache memory of another processor; if the data is acquired from main memory, it may have an old and erroneous value. (This problem does not occur when a write-through cache controller, such as the Intel 82385 found in the Compaq Systempro, is used in a multi-processor system. That's because a write-through controller writes new values back to main memory so that it will always have the most current data.)

The Corollary-designed intelligent C-bus controller in the Mitac Series 500 recognises when one processor requests data whose current value resides in another processor's cache. The cache controller that owns the current value prevents the data from being retrieved from main memory; instead, it places the correct value on the bus and sends that value to the requesting processor.

There are three slots for memory boards and six for processor boards on the C-bus. The design is a bit confusing at first because the AT form-factor C-bus cards include what looks like an ISA connector. But this is used only for power and ground pickups, not for any signal

At a glance

Mitac Series 500

Distributor: Keller Automation
Telephone: (03) 580 1355
Price: With two 25MHz 80386 processors, 8M of RAM, 380M hard disk, 150M tape drive, 1.2M and 1.44M floppy disk drives, \$US19,590; with four 25MHz 80386 processors, two 80387-25 coprocessors, Hercules card, SCO Xenix, \$US30,434

In short: The prototype Mitac Series 500 looks more like a VAX than a tower PC. With the ability to hold up to five 25MHz 486s, it has the potential to be the real speed demon. No doubt about it: the six cooling fans inside are necessary.

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interchange. There are one 8-bit and five 16-bit slots on the AT portion of the bus.

Unix is the operating system of choice for the Mitac Series 500. The initial version is SCO's Xenix System V, Release 2.3, with an enhanced, multi-processor kernel. Mitac expects support soon from SCO's Unix System V, Release 3.2, the same version that runs on the Compaq Systempro. No plans have been announced for industry-standard LAN software to operate on the Mitac.

Because we looked at a prototype unit, it's too early to guess what the Series 500's ultimate performance might be, although it's hard to imagine something powered by seven 386s being anything but fast. Although that power lies in its favour, by designing a machine that's optimised for Unix, Mitac has cut itself off from current mainstream LAN operating systems and made the Series 500 less attractive to today's wider user community. But that doesn't mean you

should completely take your eyes off Unix-based machines like this one. They could become far more attractive in the next year or so.

Compaq Systempro

The Compaq Systempro is the most ordinary-looking of the multi-processor network servers covered here. Its highly stylised tower design covers a strong but lightweight aluminium chassis and reflects Compaq's recent plunge into good-looking computers. The Systempro is also the closest in operation to a standard PC — you can even boot DOS on it — but it has more to offer you and your LAN environment than an ordinary PC. Much more.

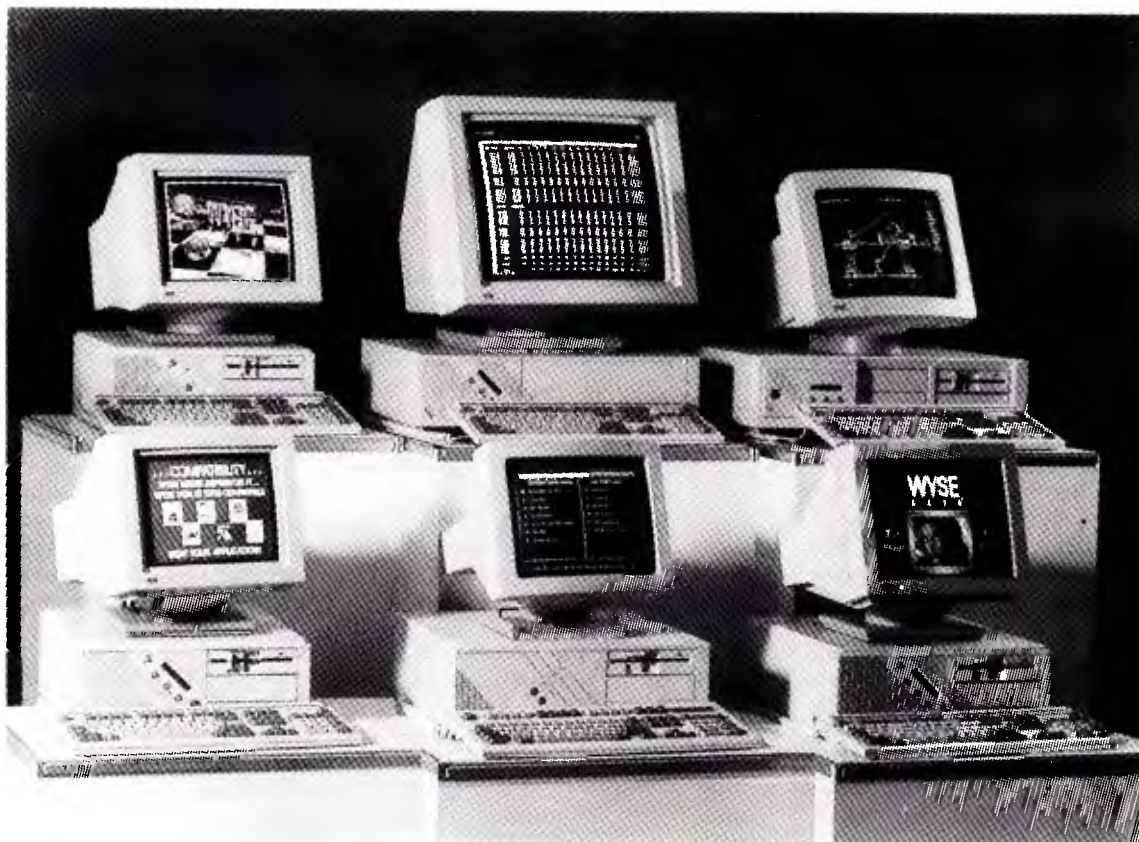
The Systempro is designed for speed from top to bottom and is configured to offer its best performance in a LAN or multi-user environment. The base-configuration Model 240 comes equipped

with a 33MHz 80386 processor and uses the Intel 82385 controller to manage a 64K cache of 25 nanosecond (ns) static RAM. The cache is interfaced to 4M of main memory through the use of Compaq's now-legendary Flexible System Architecture (Flex). Input and output are carried out across an EISA bus, and standard disk equipment includes Compaq's new IDA (Intelligent Drive Array) disk controller operating a two-spindle 240M disk drive array pair. The system also includes a 1.2M floppy disk drive.

The base system provides the sort of steamy performance Compaq is known for, but the Systempro has lots of room to grow in capacity and speed. The most obvious addition is a second processor; the system is limited to two. Compaq's designers made the growth path for the Systempro's processor flexible by allowing each one to be a 386 or 486, although both must run at a 33MHz clock

Like the Compaq Systempro, the Mitac Series 500 contains two buses, one for processor and shared memory communication, the other for I/O. The machine can hold two 25MHz 80386 and five 80486 processors, 64M of RAM and three 1G hard disks and still have five expansion slots free. Since it features 64K of cache memory on each 386 CPU, a lack of speed should never be a problem





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speed. Delivery of 486-equipped Systempros awaits the availability of certified 33MHz 486 chips from Intel.

Compaq's extended Flex architecture (Flex/MP) provides support for the dual processors, including their ability to communicate through protected areas of shared memory. The hardware design of the Systempro allows for fully symmetric operation of the two processors.

Unlike previous Compaq PCs, the unit has a system board that employs a passive backplane design, which places the main and second processor on a board mounted in a specially designed slot. (The processor board also has room for both the Weitek 3167 and Intel 80387 numeric coprocessors.) Four such slots exist in the Systempro: two are designed specifically for memory expansion; one must contain a processor board; and the fourth can accept either a memory or a processor board.

System memory can be expanded from 4 to 256M, and can consist of 1Mbit or 4Mbit DRAMs mounted on proprietary 2, 4, 8 and 32M memory cards. The cards are installed in sockets mounted on the proprietary system-memory boards. The largest, a six-socket memory board, can hold 96M of 32-bit DRAMs. That means

that a dual-processor Systempro is limited to 192M, rather than the advertised 256M; however, that's probably enough to take care of you until Compaq designs a denser memory board.

The story of EISA and IDA

Compaq was the ringleader of the 'Gang of Nine' that specified the EISA I/O bus, so it's no surprise that the Systempro is an EISA machine. Seven EISA expansion slots give the computer high-speed access to LAN-fed data via the new 32-bit network interface cards from Novell, Proteon and others. They also provide the network server access to virtually any 8, 16 or 32-bit peripheral technology that's of interest to clients on the system.

Perhaps best of all, the new EISA bus inspired Compaq to build the innovative IDA controller, which provides a flexible method of managing disk drives in a networked environment. You might want to consider the Intel 80186-based controller as an asymmetric addition to the Systempro's multi-processing capabilities because, much like a mainframe's disk controller, it adds serious amounts of processing intelligence to the disk-based data manage-

ment process. (Of course, it's not a true asymmetric addition, as the main processors have to operate the device drivers that tell the IDA what to do.)

Compaq's engineers took a serious look at how disk performance could be optimised in a LAN or multi-user environment before they put mouse to CAD program. Perhaps their most important conclusion is that not every application needs the same sort of disk management: users have different priorities when it comes to the inevitable tradeoffs among data acquisition speed, data volume and data security. The Compaq IDA is designed to fulfill the most common of those needs.

The IDA makes life as simple as possible for the operating system controlling the Systempro because whatever else is going on, all drives operated by IDA can be treated as a single disk. The IDA also has designed-in bus-mastering technology; it can transfer data across the bus without any supervision from the CPU.

Even though the system thinks there is but one disk drive, the smallest number of disks controlled by the IDA is one array pair — that is, two Conner-made 3.5in half-height hard disks. Array pairs come in 240 and 420M capacities, with each

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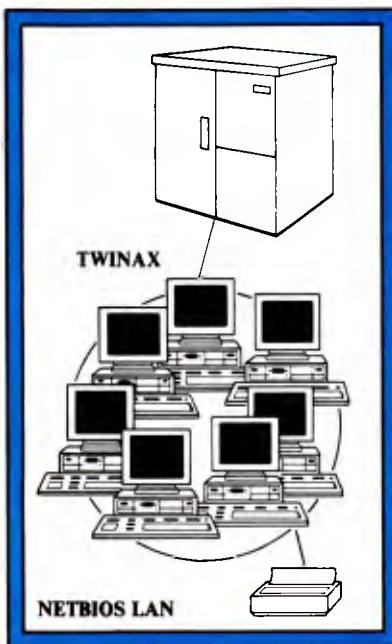


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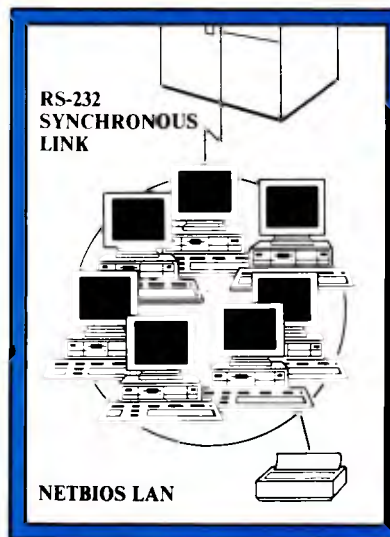
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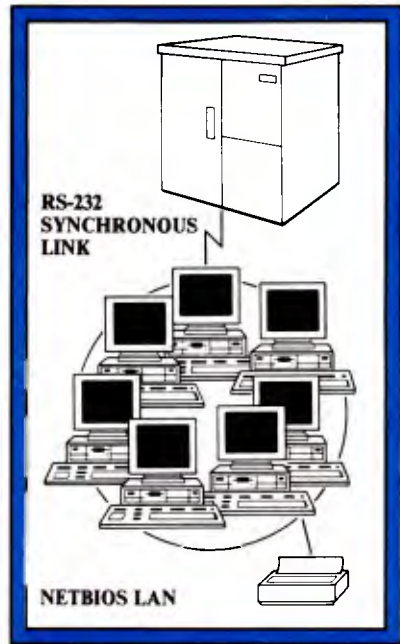


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BLUELYNX/ 5250-12 REMOTE GATEWAY



5250-12 Remote Gateway

You get the same 5250 midrange power for your LAN with the advantages of remote access. With a single adapter, your PC or PS/2 functions as a remote gateway server, connecting to the host system (IBM System/3x or AS/400) via synchronous modem or modem eliminator.

The Gateway Server can route information for up to nine node PCs or PS/2s distributed across the network. And up to four Gateway Servers can operate on one network and communicate with an equal number of mid-range systems simultaneously. So BLUELYNX can help you support 36 sessions on a single LAN — remotely!

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At a glance

Compaq Systempro

Distributor: Compaq
Telephone: (02) 660 0077
Price: With 33MHz 80386, 4M of RAM, 240M hard disk, 1.2M floppy disk drive, \$27,532; with two 33MHz 80386s, 12M of RAM, 840M hard disk, 150/250M tape drive, 1.44M and 1.2M floppy disk drives, VGA monitor, 80387-33 coprocessor, Weitek 3167-33 coprocessor, DOS 4.01, OS/2 1.1, 2400bps modem, technical reference guide, \$71,260

In short: The speed-oriented Systempro, which runs with up to two 80386s, two 80486s or one of each, features symmetric processing and disk mirroring. Highly expandable, it's an exciting file-server solution for today's high-powered LANs.

drive in the pair having half that capacity. Disk drives are added in array pairs, and the Systempro cabinet can hold up to four pairs (eight physical drives). If 420M array pairs are used, that yields a capacity of 1.6G (gigabytes); you get just short of 1G if the 240M pairs are installed. An expansion cabinet that will hold up to eight more drives is planned.

Adding capacity by adding disk drives is nothing new, but the IDA adds drives in such a way that the Systempro can acquire or store data more quickly. All disks are controlled so that the same sectors are indexed to all the drive heads at the same time. This allows the IDA to treat them in parallel form, accessing data from (or to) all disks at the same time. If you have four disk drives installed (that's two array pairs), four sectors of data written to the drive array will be stored on the four physical drives, one sector per drive. Therefore, the arithmetic is simple: the time required to write or read data is divided by the number of drives installed.

The IDA provides optimum service to simultaneous multiple disk access requests. Requests for data to be read or written from different drives in the array can be serviced at the same time. At

Multiple-processor servers: summary of features

	Compaq Systempro	Mitac Series 500	NetFrame NF100
Microprocessor options	Up to two 33MHz 80386s or two 33MHz 80486s	Two to seven 25MHz 80386s or two 25MHz 80386s and up to five 25MHz 80486s	Up to five 25MHz 80386s and one 8088
Motherboard manufacturer	Compaq	Mitac	NetFrame
Chip set manufacturer	Compaq/Intel	GLUE Logic	Intel/NetFrame
System RAM arrangement	Page mode	Nibble mode	Page mode
Wait states	0	0	0
Coprocessor	80387-33 and Weitek 3167-33	80387-25 or 80487-25	80387-25
Processor RAM cache			
Cache controller	Two	One per CPU	One
RAM cache size	64K per processor	64K on 386 processor, 256K on 486	32K per processor
Rated speed (nanoseconds)	25	25	25
Add-in memory board			
Installed RAM	12M	8M	8M
Maximum installable RAM	256M with one processor, 192M with two processors	64M	64M with one processor, 192M with five processors
Chip size	1M or 4M	1M	1M
Password in ROM	●	●	○
System shadowing/can be disabled	●/○	●/●	○/○
Video shadowing/can be disabled	●/○	●/●	○/○
Hard disk			
Manufacturer	Conner Peripherals	Maxtor	CDC, Hewlett-Packard, Hitachi, Maxtor
Disk capacity	840M	380M	760M
Number installable	2	3	4 (21 with expansion cabinet)
Interface	Intelligent Drive Array	SCSI	SCSI
Average access time (milliseconds)	18	18	16
Disk mirroring	●	○	●
Controller location	Card	SCSI/CPU board	Card
Controller manufacturer	Compaq	Corollary/Mitac	NetFrame
Hard disk options	120M, 210M, 320M, 650M	100M, 200M, 380M, 760M, 1G	380M, 760M
Tape drive			
Capacity	150M	150M	Unlimited
Tape medium	DC-600	DC-600	8mm tape or DAT
Expansion			
Expansion slots	7 EISA, 4 proprietary	6 C-bus, 3 C/AT-bus, 5 AT-bus, 1 I/O	3 I/O or application processor, 2 memory expansion
Available slots	4 EISA, 1 proprietary	3 C-bus, 3 C/AT-bus, 4 AT-bus	2 I/O or application processor, 2 memory expansion
Drive bays	10 half-height, 1 one-third-height	6 half-height, 1 one-third-height	4 full-height, 16 half-height
Physical features			
Power supply (watts)	300	500	1500
Switchable power supply	●	●	●
Number of device connectors	11	7	None
Keyboard lock	●	○	○
Case lock	●	○	○
Power-on switch	Front	Front (key required)	Remote-controlled
● — Yes ○ — No			

16MHz, the 80186 processor is fast enough at optimising the processing of queued requests that the quickest possible data transfers to and from memory take place.

Disk mirroring

Reliability is a major issue for some installations, and the IDA offers two methods of providing serious data integrity protection to Systempro users. Disk mirroring has long been used by fault-tolerant minicomputers, and it can be implemented in the IDA: any data stored is written to two disks in the system at the same time.

While disk mirroring provides almost perfect protection against equipment failure, it cuts storage capacity in half, so Compaq developed a technology called disk guarding, which encodes all data written to three disk drives onto a fourth one. In the event of a base disk's failure, data can be reconstructed from the en-

coded data and the data from the other disks. If the encoded disk fails, it can be replaced and the encoded data rebuilt from the other three. The advantage of disk guarding is that total disk capacity is reduced by only 25 per cent.

Compaq plans to make its own version of LAN Manager the principal Systempro operating system when version 2 becomes available from Microsoft. LAN Manager will operate the two processors asymmetrically. One processor will operate the LAN Manager kernel and any server-based applications, while the other will operate the full, 32-bit version of the Microsoft High Performance File System.

Currently, SCO Unix is available for the Systempro. The SCO implementation of the AT&T time-sharing system operates the processors symmetrically using the Multiprocessing Extension to the company's System V/386 Release 3.2, which was developed jointly with

Compaq and Corollary. The implementation uses a shared copy of Unix, which allocates tasks from the run list to each processor equally on a FIFO (first in, first out) basis.

Banyan has announced that its Unix-based VINES network operating system will also be available for the Systempro; VINES will use the processors symmetrically. Novell has not introduced a version of NetWare 386 for the Systempro but plans to do so shortly. It will probably implement the multiple processors asymmetrically.

It's hard to argue with either the Compaq name or the quality and design of the Systempro. Performance of even a one-processor model tends to be blistering, and the unit would be worth buying just for the flexibility, security and performance offered by the IDA drive technology. The early morning line is that the Systempro may be the multi-processor of choice, although you may want to keep

A fully loaded \$71,000 Compaq Systempro comes complete with two 33MHz 80386 processors located on cards attached to the passive backplane system board, an 840MB hard disk, a tape drive, a VGA monitor, two math coprocessors, and a modem. Flex architecture lets the processors communicate through protected areas of shared memory and allows fully symmetric processing. To ensure data integrity, the Systempro showcases disk guarding and disk mirroring, which provide protection against equipment failure. With five expansion slots to spare and the option of installing two 33MHz 80486 processors, it's on the forefront of server technology



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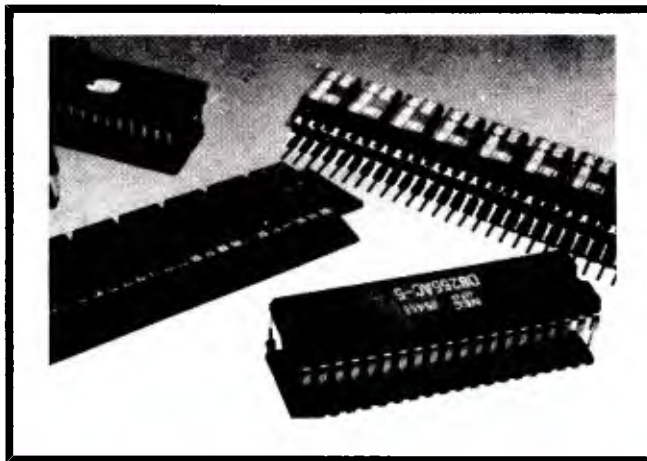
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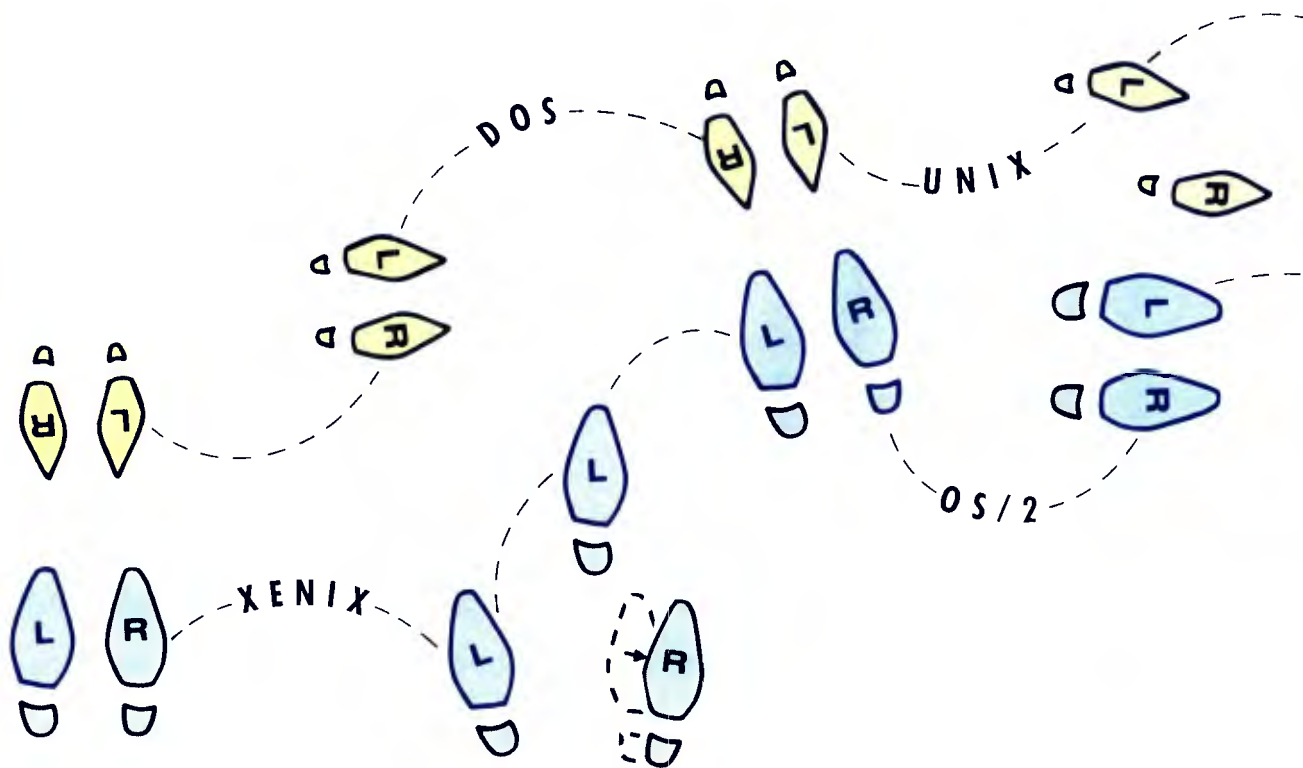
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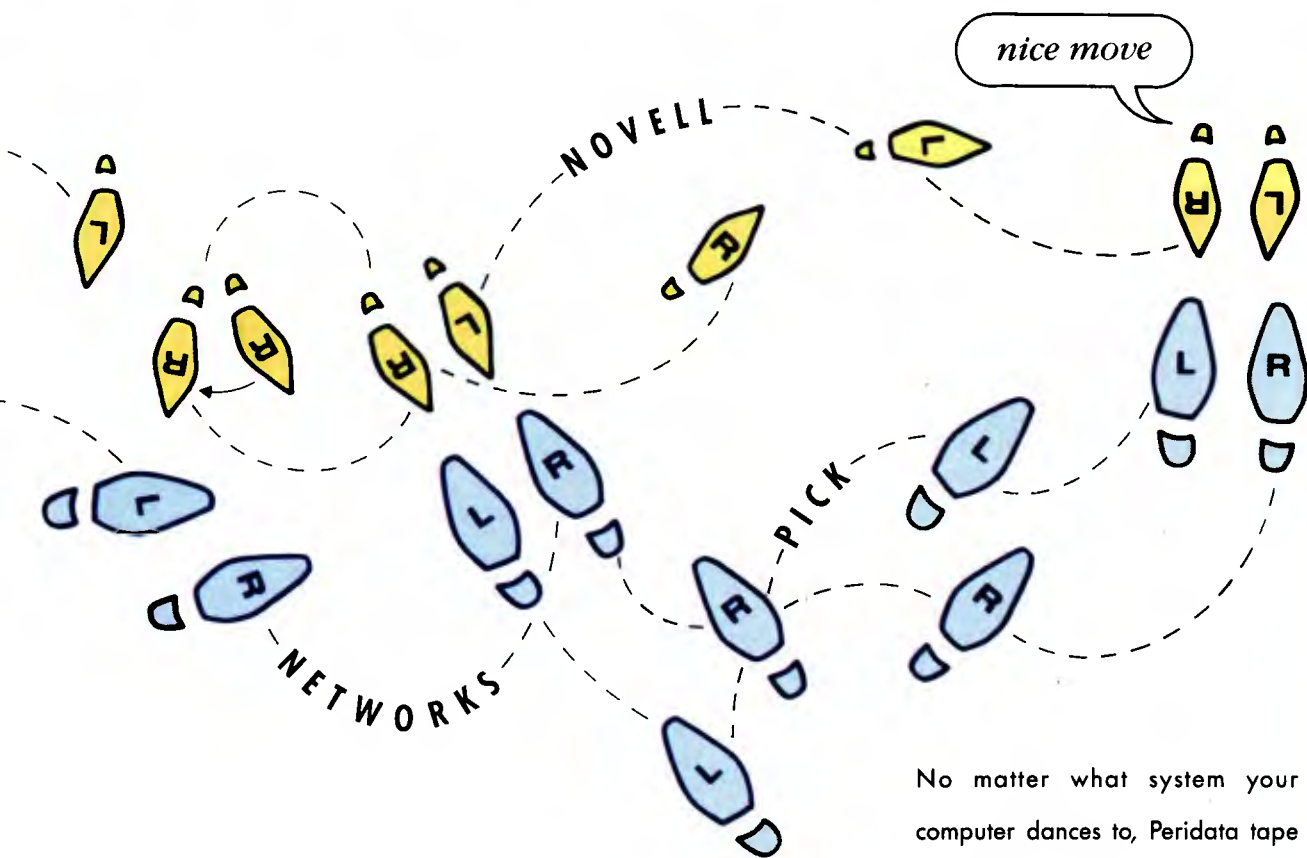
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an eye on other things as well. Two 486s are probably enough for any server needs you have in the next year, but you should look ahead and determine whether your server-based applications will take you beyond that capacity. You can be sure that Compaq is looking at that issue, too.

NetFrame NF100

NetFrame System's sleek, matte-black finished file servers look so much like hi-tech stereo speakers you'll be more likely to ask what size woofers they have than how much CPU power they contain. In fact, the NetFrame NF100, NF300 and NF400 computers host substantial 386 or 486 processing power. Their multiprocessing design and overall system architecture inherits a lot of technology from the mainframe world. The combination gives NetFrames their name.

The networking side of the NetFrame strategy is at the root of the system ar-

chitecture. It is an asymmetric multiprocessor design that has two dimensions along which LAN-based processing power can grow. On one dimension, more users can be added by increasing input/output processing; on the other, processing power can be added to operate one or more server-based applications.

Every NetFrame contains at least one central system processor. The system processor used in the NF100 and the NF300 is a 25MHz 80386; a 25MHz 80486 is used in the NF400. Each NetFrame must also have at least one I/O processor, powered by an Intel 80376. The 80376 is the protected-mode only version of the familiar 16-bit 80386SX, and is more often found in industrial control and other embedded applications. All processors in the system communicate through shared memory.

In the future, the systems will also contain one or more processors for

operating server-based applications. As of this writing, NetFrame Systems is still developing applications processors. Plans call for these to be powered by a 25MHz 80486 and to come configured with at least 8M of cached RAM. Applications processors will interface to the central system processor through the same DS logic used by I/O processors (described below). Until the applications processors become available, server-based applications will have to run on the central system processor.

Another type of processor — the service processor — helps out with the configuration and maintenance of all NetFrames. This 8088-based computer is mounted on the central system processor's board and controls the three-button LCD console at the top of the cabinet. The service processor also operates NetFrame's telephone notification system, which calls to tell you when your server is down.

With a base price of \$US22,500, the NetFrame NF100 is at the low end of NetFrame's powerful family of file servers. The NF100 can hold up to four 25MHz 80386s and four hard disks, and with an optional expansion cabinet, the system can handle an additional 17 hard disks. There is no keyboard or monitor; the NF100 is operated by using a PC as a remote console (NetFrame has special software for the task). One unique feature of the system: an 8088-based service processor is mounted on the CPU card just to keep track of system diagnostics

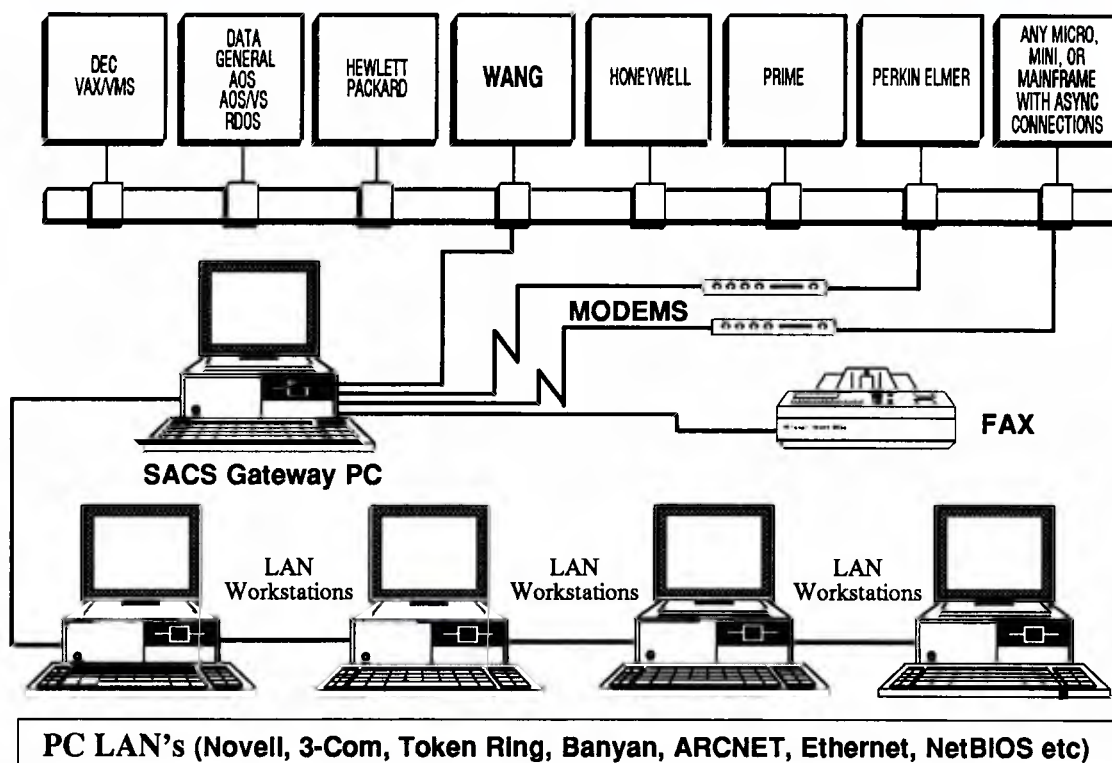


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The vertically-mounted central system board rests at the rear of the cabinet. Besides the 386 or 486 processor, the board contains an 80387 numeric coprocessor, a custom-controlled 32K static RAM cache, and NetFrame-designed ASICs (application-specified integrated circuits) to handle both the memory bus and the separate, proprietary, hierarchical I/O bus. Slots for memory cards are found here, as well as slots for mounting I/O or applications processors.

The NF100 can house up to two memory boards and three I/O or applications processor boards. The NF300 and NF400 accommodate double the number of memory boards and up to eight I/O or applications processor boards. Memory can be added to the central system processor using proprietary 8 or 16M memory cards; the minimum memory configuration for the NF100 is 8M, while the NF300 and NF400 require at least 16M of RAM. Any model NetFrame can use up to 64M of RAM. NetFrame memory is self-correcting through the use of a 7-bit/word error check code (ECC) scheme, managed by the ASIC that controls the central processor's access to shared memory.

Access to shared memory by I/O and applications processors is controlled by NetFrame-designed DS (data server) ASICs. Each DS chip (there are two on the NF100 and four on the larger models) controls a separate high-speed 16-bit bus that implements shared memory access through simple time slicing rather than a complex arbitration scheme. The time-slicing strategy divides bus access linearly among the DS ASICs in the system.

Mainframe similarities

The NetFrame computer's mainframe-like quality truly comes to light when you look at how the I/O processors are designed to work. Their job is to acquire data from relatively low-speed devices, queue it, and hand it up to the central system processor at memory speed. The reverse occurs when data needs to be presented to or stored on the low-speed devices. In general, the system provides the sort of intelligent handling of I/O chores found in mainframes. The I/O processors control logic, and data concentration relieves the central system processor of dealing with single-byte data access, LAN protocols, or the current location of data on a disk drive.

To do that job, each I/O processor board contains, besides the 16MHz 80376, 1M of RAM and a custom DSI (DS bus interface) chip set that keeps it talking politely to the DS chip on the central

At a glance

NetFrame NF100

Distributor: NetFrame Systems (US)

Telephone: (408) 944 4167

Price: With 25MHz 80386 processor, 8M of RAM, 380M hard disk, I/O Server Board/E, System Administration Software, Server Activated Maintenance, \$US22,500; with 16M of RAM, 760M hard disk, Token-Ring I/O Server Board, \$US31,000. Model NF300 with enhanced expansion capabilities, \$US35,000. Model NF400 with 25MHz 80486, \$US45,000

In short: The unusual-looking NetFrame box holds up to four 25MHz 80386s in its least expensive NF100 configuration. More expensive models offer greater expandability coupled with more processing power.

system board. The I/O processor also includes sufficient connection hardware to keep a NetFrame communicating with its own world. The outside LAN world is serviced through an Ethernet connector; an ordinary RS-232 connector is used for printers and other serial devices, and an RS-422 connector is there for LocalTalk networks. A Token Ring edition of the NetFrame I/O processor is also in the planning stage.

A high-speed, 8-bit SCSI interface on each I/O processor board controls disks and tape drives. The SCSI port is itself controlled by the 80376 and can be used by that processor for small-volume data transfers (as in any ordinary PC). In such a case, data is acquired, then queued in the I/O processor and handed off to shared memory using the DSI/DS logic; the reverse happens when data is written to the disk. Large-volume transfers are serviced more rapidly by connecting the SCSI port to the NetFrame's shared memory via DMA (direct memory access) using specialised circuitry in the DSI chips.

Disk drive size and organisation are flexible in NetFrame systems. The smallest single-drive system in an NF100 cabinet contains a 190M SCSI disk, but a

typical configuration will contain at least two disks of 500M or better.

Multiple drives can be run by one I/O processor and either chained together to look like one drive, run separately or linked in a disk-mirroring scheme to provide fault-tolerant data integrity. Alternatively, multiple I/O processors can each operate single or multiple drives, or an I/O processor can be installed with no disk drives attached to its SCSI port; as long as one processor has access to the drive(s), the data will be available using NetFrame's shared-memory scheme.

Suitable operating systems

You operate the NetFrame using a PC as a remote console. Novell's NetWare 386 is currently the only LAN operating system available for the new computers; NetFrame has provided a Microsoft Windows-based remote console interface. LAN Manager, version 2.0, is scheduled for implementation on the NetFrame, as is Banyan's VINES.

NetWare provides a good model of how all network operating systems will operate on NetFrame computers. The asymmetric design requires that NetWare's main kernel be installed on the central system processor. Individual, low-level device drivers are installed on I/O processors, and NetWare's server-based applications (Network Load Modules, or NLMs) can be installed either on the central system processor or on an applications processor.

NetWare runs normally on the central system processor. Only when an I/O request comes up do things change. When a request from an attached workstation comes in, the I/O processor receives it, formats a message to the NetWare kernel, and places the message into a queue in shared memory where the central system processor picks it up and processes it. The reverse happens if the server needs to request data, and any large blocks of data are transmitted through buffers in shared memory. When applications processors are available, an NLM or OS/2 application can be installed on a dedicated or shared server.

When it becomes available locally, the NetFrame will present a neat solution for an organisation that needs lots of servers. You can put the equivalent of several into one NetFrame box; how many depends only on whether you buy the NF100, NF300 or NF400. Additionally, the NetFrame family has a stable and well-accepted software complement in NetWare 386, and you can expect Novell's server-based applications to become as well accepted as those of LAN Manager.

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The UTP standard arrives

One of the hottest words in the computer industry right now is 10BASE-T — and with good reason. It will allow users to run 10Mbps Ethernet over unshielded twisted-pair (UTP) wiring in a standard fashion. I say 'will' because the standard isn't expected to be final until September. However, that isn't stopping vendors from announcing products compatible with the emerging standard.

Computer and networking vendors have been offering their own implementations of Ethernet over UTP for the past few years. As a result, the standardisation effort became highly political, with individual vendors backing the proposal that most closely matched their own implementation. Now that a draft standard exists, vendors are rushing to meet the demand for products. Many are confronted with revamping their product offerings.

What exactly is 10BASE-T, and how can you be sure that products you buy comply with this standard? I will detail what the 10BASE-T draft specifies.

The 10BASE-T specification is being defined by the 10BASE-T Task Force, which is a subcomponent of the IEEE project 802. IEEE has established committees to develop standards for local and metropolitan area networks. The 802 committees have developed specifications for the physical and data link layers of the Open Systems Interconnection (OSI) model for communications. These are the two lowest layers of the model and are responsible for providing a physical circuit and managing the transfer of data.

To keep the OSI and 802 specifications as compatible as possible, the 802 committees split the data link layer into two sublayers, the logical link control (LLC) and media access control (MAC). The LLC is independent of the access



method (such as Token Ring), while the MAC is protocol specific. Fig 1 depicts several of the 802 standards and their relationship to these OSI layers.

Among the specifications already developed, or being developed, by the 802.3 committee are 10BASE5 (Ethernet on coaxial cable), 10BASE2 (thin Ethernet or Cheapernet), 10BROAD36 (broadband Ethernet), 1BASE5 (Starlan), 10BASE-F (fibre optics) and 10BASE-T. These designations are a concatenation of three pieces of information. The first numeric portion is equal to the bandwidth in megabits per second. Following the bandwidth is 'Broad' or 'Base', an identifier that refers to either a broadband or baseband system. The final value specifies either the medium used or the maximum segment length in metres.

Thus, 10BASE2 identifies a specification for a 10Mbps baseband system on RJ-58 coaxial cable with a segment

At last, 10BASE-T promises to impose standards on vendors who offer implementations of Ethernet on unshielded twisted-pair wiring. Greg Campbell describes 10BASE-T and tells you how you can be sure that the products you buy will comply with its specifications.

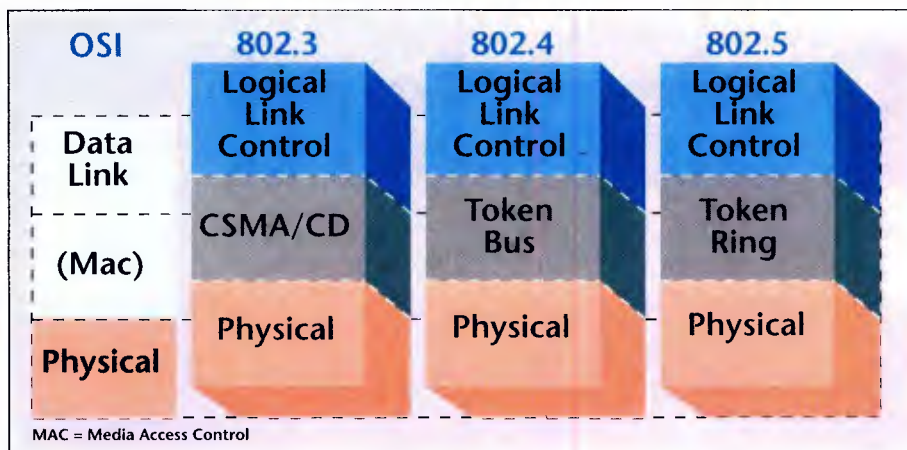


Fig 1 The IEEE 802 standards conform to the physical and data link layers of the OSI model

length of 200 metres. 10BASE-T specifies a 10Mbps baseband system over UTP with a segment length of 100 metres.

History of Ethernet, 802.3 and 10BASE-T

Ethernet was originally developed at the Xerox Palo Alto Research Centre (PARC) in California in the 1970s. It was partially based on work done at the University of Hawaii on the ALOHA system, which used a technique whereby users competed for a communications channel. Ethernet uses a scheme known as carrier sense multiple access with collision detection (CSMA/CD) for controlling access on a local area network. In 1980, Xerox, Intel and Digital Equipment Corporation jointly published the first specification for an Ethernet local area network. This specification was updated two years later as Ethernet 2.0. In 1985, the IEEE standards committee released the 802.3 10BASE5 specification; this was similar to the Ethernet specification but called for a different packet composition. Following the original 10BASE5 specification, the IEEE developed the 10BASE2, 10BROAD36 and 1BASE5 standards.

Meanwhile, significant research was going into the development of an Ethernet system that could run over twisted-pair wiring. In 1987, Xerox PARC spinoff SynOptics Communications released the first 10Mbps 802.3 compatible system to operate over twisted pair. SynOptics' LattisNet was one of a number of Ethernet-over-twisted-pair products that gained immediate popularity. The problem with LattisNet and systems from vendors such as AT&T and Hewlett-Packard was that each implementation was proprietary. The different vendors' components would not interoperate and there was no standard.

In August 1987, the first meeting of

the 10BASE-T Task Force was held to begin work on establishing a standard for 10Mbps Ethernet over UTP wire. Since many vendors had already made a significant investment in their proprietary systems, several proposals were submitted for consideration as the basis of the specification. Among the proposals submitted was an alternate to using Ethernet's Manchester encoding from David Systems; an attachment unit interface (AUI) approach, from a coalition of Hewlett-Packard, AT&T and SynOptics, which called for enhancing the existing 802.3 standard; and a balun approach from 3Com and DEC, which called for using a balun to convert from coaxial cable to twisted-pair wiring.

The AUI approach was adopted by the committee in March 1988 as the best means to provide twisted-pair technology while retaining compatibility with existing 802.3 systems. Major or active participants in the 10BASE-T committee include AT&T, Hewlett-Packard, SynOptics, Wang Laboratories, Western Digital, 3Com, Advanced Micro Devices, Cabletron, David Systems, DEC, Intel, National Semiconductor, NCR, Ungermann-Bass and Racal-InterLan.

The ins and outs of the specification

The 10BASE-T specification, known as a draft supplement to IEEE standard 802.3 type 10BASE-T, will be a modification to the existing 802.3 standard. The new specification has several objectives. One is to provide the physical means for communication between LAN data link entities — found on network interface cards (NICs) and repeaters, for example — using twisted-pair wiring and telephony wiring practices.

In addition, products based on the specification must be low cost, and easy

to install and service. Finally, the specification must ensure compatibility of independently developed network interfaces (such as those found on NICs and repeaters) and a mean bit error rate of one in every 10^8 . The incorporation of this supplement in the 802.3 standard should have no impact on the specification for existing 802.3 compatible systems. Rather, it builds on sections of the existing standard. This ensures backward compatibility with all existing 802.3 compatible devices, while allowing for use of twisted-pair wiring.

The draft begins with a list of requested revisions to the existing 802.3 standard. Although 10BASE-T builds on the base 802.3 standard, it has a number of key differences, including a requirement for structured (star) wiring, a 100m recommended segment length and a link integrity test.

Section nine contains significant revisions to the specification of a repeater unit. In addition to using star-type wiring, 10BASE-T repeaters will have the ability to disconnect a segment of the network if there is a failure. Sections 13 and 14 are new sections. Section 13, 'System Considerations for Multi-Segment Networks', provides information on building a multi-segment 10Mbps baseband CSMA/CD network. This portion of the draft will cover all types of 10BASE networks, not just 10BASE-T.

Section 14, which defines a twisted-pair link, comprises the bulk of the draft. This section covers the functional, electrical and mechanical characteristics of the 10BASE-T media access unit (MAU) and the twisted-pair medium to be used with that MAU. A MAU manages the connection of data terminal equipment (DTE) or repeaters to the cable. DTE can be a personal computer, for example.

The relationship of the 10BASE-T specification to the rest of the 802.3 standard and the OSI model is shown in Fig 2. Fig 2 illustrates the three components of a physical 802.3 network: the DTE or repeater, the MAU and the medium.

MAUs and repeaters

A MAU is divided into two subsections, the physical medium attachment (PMA) and the medium dependent interface (MDI). The PMA is the portion of the MAU that contains the functional circuitry, while the MDI is the mechanical and electrical interface between the twisted-pair link segment and the MAU. All implementations of the twisted-pair link must be compatible at the MDI. However, vendors are free to implement circuitry in the MAU in their own fashion, provided the MDI and AUI specifications are met.

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The MAU provides services, such as message handling, to the physical signaling sublayer (PSS) in the DTE; this sublayer facilitates the coupling between the MAU and the data link layer. The MAU's services are provided by means of the AUI. Defined in the 802.3 standard, the AUI specifies the interface between the MAU and DTE or repeater.

A MAU can be incorporated within a DTE or repeater unit, or it can be implemented externally, as in a transceiver. In an external MAU, the AUI circuits physically exist (for example, as a cable connecting the MAU to the AUI port on a NIC). If the MAU is internal, the AUI exists logically only.

MAUs provide transmit, receive, loopback, collision presence, jabber and link integrity functions. To understand these functions, it's helpful to think of 802.3 Ethernet as a group conversation. Transmit, receive and loopback transfer Manchester-encoded data on or off the circuits; this is similar to an individual's ability to speak and listen in our conversation analogy. In a group conversation, only one person can speak at a time to be understood. Collision presence detects and reports a collision of data. This is analogous to several people speaking at once; to be understood, only one person can be allowed to speak at a time.

The jabber function prevents a faulty MAU from disrupting transmission on the network by disabling the MAU after it has transmitted for a length of time greater than the allowable maximum. When the MAU has been in an idle state for a minimum length of time, it will be enabled again. In our conversation scenario, this would represent one person babbling continuously so that no one else who tried to speak could be understood. The babbler would be gagged for a certain length of time. Then the gag would be removed and he or she could participate in the conversation again.

The link integrity test function determines whether the link or connection

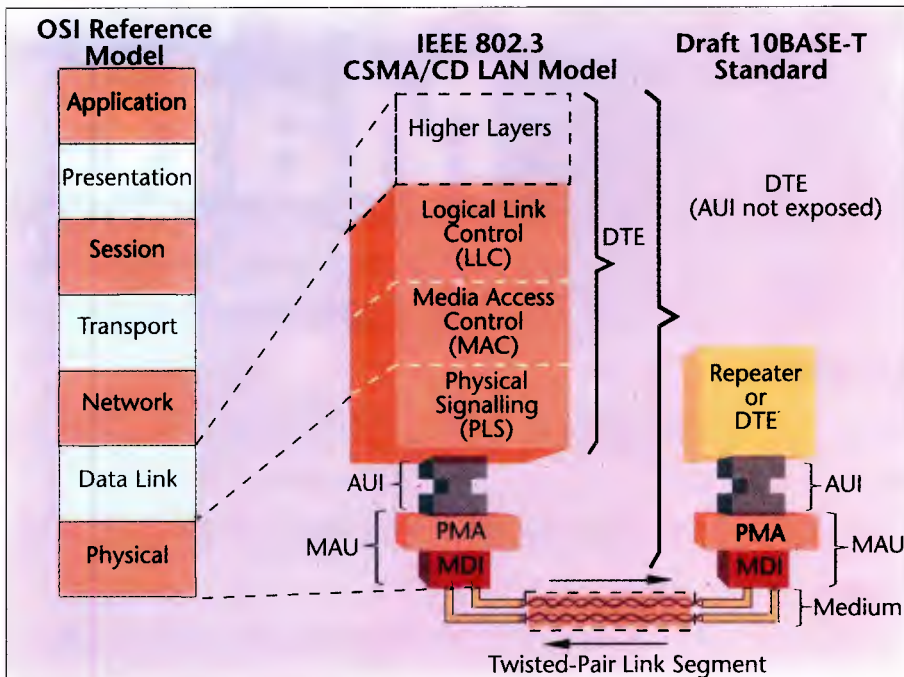


Fig 2 The main components of a physical 802.3 network — the data terminal equipment (DTE) or repeater, the media access unit (MAU) and the medium — relate to the physical and data link layers of the OSI model

between two devices is active or not. Hubs periodically send a link integrity pulse to each MAU. If there is no response within a given period of time, the transmission, reception and loopback of data is disabled and the MAU enters the link test fail state. When the MAU begins sending link pulses again, it reverts to the link test pass state. If a vendor has provided a link integrity indicator on a MAU or hub, it should be labelled appropriately and be green when the device is in the link test pass state.

Link integrity is like a moderator who queries each participant on his or her health. We would not want to give important instructions to someone who was unable to hear or could not understand. The green light signifies that each individual can participate.

The MAU also provides the signal-quality-error (SQE) message test function, which indicates to the DTE that the collision presence function is operational and that a signal can be sent by the MAU.

A repeater unit is used to extend the physical network topology and provides for coupling of two or more cables segments. A MAU can be incorporated within the physical bounds of a DTE or repeater unit. One of the most significant differences between a 10BASE-T repeater and other 10BASE repeaters is the requirement that a star-wired topology be used instead of the common bus topology. The star topology provides the manageability and ease of installation and service stated in the draft objectives, as well as the other benefits of a structured wiring system. With star systems, a

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failure in the link between one MAU and another will only affect that one link segment rather than the entire network, as is the case with a bus topology.

All repeaters with 10BASE-T MAUs must also support the auto partition/reconnection algorithm. This algorithm allows a repeater to automatically partition or disconnect a port, thus disabling connections in the event of excessive collisions, a single collision of excessive length, jabbering nodes or, link test fail state. Ports are automatically reconnected when the fault condition is rectified. Hence, the failure of a single port disables only that particular port, not the entire repeater.

10BASE-T's medium specifications

Twisted-pair wire is the medium for 10BASE-T. The standard is being developed to take advantage of a large portion of the installed base of telephony wiring. Thus, it must be compatible with different types of wiring, cable connectors and cross connects. (The Telecommunications Industry Association is currently developing Standards Proposal No. 1907, which will take LAN wiring

requirements into account and make them part of typical telephony practices.)

Telephony wire normally consists of 22 to 26 American Wire Gauge (AWG) unshielded wire in a multi-pair cable. D inside wire (DIW) is the commonly used 24 AWG (0.5 millimetre) twisted-pair wire. The draft recommends — but does not require — that cable segments based on these types of wire be 100 metres long to conform to 10BASE-T.

Section 14.4 details an array of parameters that twisted-pair media must satisfy. These parameters include at-

tenuation, cross talk, jitter, delay and bundling of pairs. In order to achieve the desired error rate in conjunction with attenuation, near-end cross talk, intelligent squelch and a segment length of 100 metres, 5-volt peak-to-peak signalling was adopted. This voltage provides a way of achieving the desired distance without too much impact from the limiting factors stated above. Many of the proprietary systems use 2 or 3 volts.

Intelligent squelch allows 10BASE-T to function in an environment of mixed signals, including regular telephone ser-

Australia: slow off the blocks

The idea of using existing telephone cable for Ethernet has been less enthusiastically embraced in Australia than other countries. Here, most of the wiring is two pair (four wire) and Telecom has only started to install three pair (six wire) cable in the last few years. In other words, there are literally not enough wires in a lot of Australian cabling to allow you to run Ethernet and telephone voice messaging at the same time. This means that most Australian users will have to install new cable if they want to run both together.

There is also the problem of Telecom approval. Telecom owns the cabling and is not keen on it being used for anything else. Vendors selling twisted pair solutions in Australia do not suggest that you run over the existing telephone wire . . . for the moment: imminent deregulation of the telecommunications industry, much greater availability of USP-based products and demand for lower installation costs of Ethernet systems should force Australia to follow the world lead.

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vices, digital phone systems, Integrated Services Digital Network (ISDN) and RS-232. Intelligent squelch 'turns down' the noise of unrelated signals so that Ethernet can accurately be discerned. A multitude of frequencies were tested to determine whether an Ethernet signal could be characterised and discriminated from among other cyclical signals and this was found to be the case. A CB or ham radio has a similar function to squelch extraneous noise so that you can hear a broadcast better.

Another problem that had to be addressed in 10BASE-T is jitter. As a signal travels across a cable segment, it becomes distorted from its original form. This is known as jitter and is influenced by the medium, frequency and length of the segment. Just as a television signal becomes fuzzy and the picture blurs when travelling from the station to your antenna over a long distance or when competing with other 'noise', the form of a digital pulse becomes distorted across a cable segment. There are two approaches which can be taken to solving this problem: post-equalisation and pre-equalisation.

As its name implies, post-equalisation is performed after the signal has reached its destination. With post-equalisation, a second factor is applied to the signal to offset the first factor of distortion and to return the signal to its original form. This is difficult, however, because it is impossible to know what the signal originally looked like. As a result, you can only derive the second factor from an approximation of the distortion characteristics.

Post-equalisation was the method for overcoming jitter proposed in the original 10BASE-T specification. During the ratification process, however, pre-equalisation was adopted. Pre-equalisation is performed before the signal is sent. Since the shape of the signal is known and the distortion can be approximated, the signal is pre-distorted to compensate for the distortion it will undergo while being transmitted. Thus, the signal should be a close approximation of its original form when it arrives at its destination. Since the distortion factor was an approximation in both methods, it seemed more intelligent to apply this to a known factor (the original signal), as is the case with pre-equalisation.

Multi-segment networks

Section 13 of the draft provides information on building 10Mbps baseband networks that consist of multiple segments. This section defines the rules for interconnecting 10BASE-T and all other 802.3-compatible networks regardless of media

type. Rules for interconnecting all valid media types are included, as is information on the Fibre-Optic Inter Repeater Link (FOIRL) standard for using fibre to link repeaters. (FOIRL should not be confused with 10BASE-F, which deals with MAUs connected by fibre-optic segments.)

The physical size of this type of mixed-media network is constrained by the limits of the individual network components. These limits include cable length and propagation delay, repeater unit delay, MAU delay and delays within the DTE associated with the CMA/CD access method.

Ethernet for the future

10BASE-T is more than just a specification for twisted-pair MAUs and media. It is an addendum to the existing 802.3 specification and incorporates many of the changes in networking philosophy that have emerged since the last ratification of the 802.3 standard. For example, the adoption in 10BASE-T of a structured cabling methodology and star topology moves Ethernet away from the limitations inherent in the bus topology commonly used with Ethernet. Fault diagnosis and isolation are easier with a star design, making 10BASE-T a more attractive option.

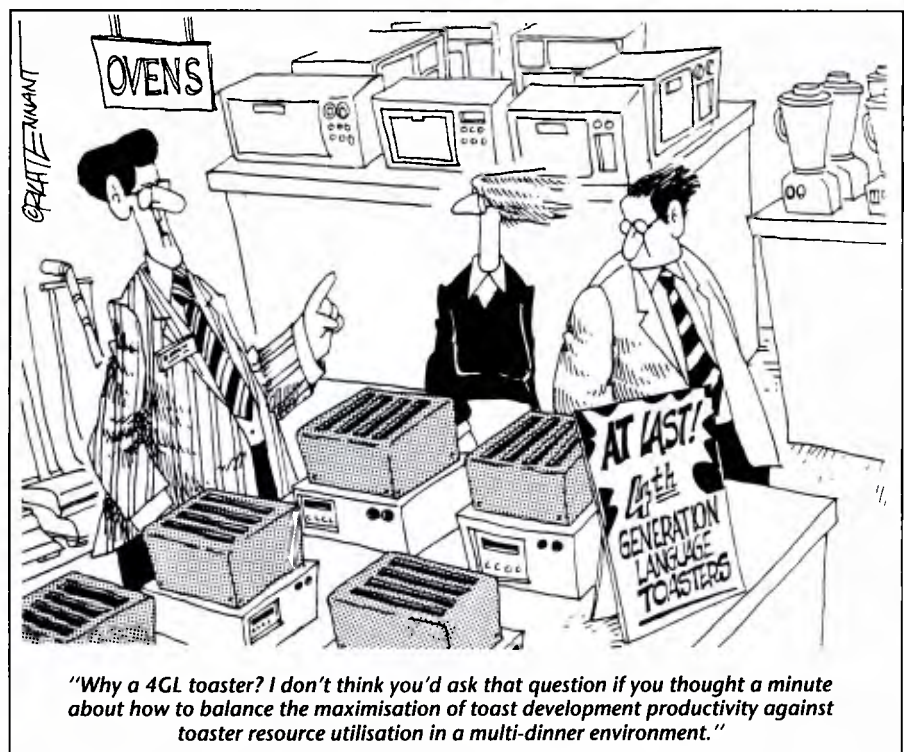
In addition, by specifying twisted-pair medium, 10BASE-T allows users to access a huge installed base of telephony wire. The need for 10BASE-T is demonstrated by the fact that an estimated 40 per cent

of all Ethernet installations last year were UTP, even though no standard existed. With the emergence of a standard under which all vendors equipment can interoperate, users will receive the benefits of competitive pricing, product interoperability and vendor independence.

The current version of the specification is draft 10, which was issued in February and expires May 31. The cover of the draft explicitly states that it is an unapproved draft and no one should 'specify or claim conformance to this document'. This means that any vendor claiming 10BASE-T compatibility for its products is actually claiming compatibility with an unofficial draft standard. Because a number of vendors have already begun marketing what they call 10BASE-T compliant products, the IEEE has issued a statement that advertisements implying compliance with the 10BASE-T standard are unauthorised and do not accurately reflect the state of the standards development process. Anyone purchasing products from a vendor claiming compatibility should investigate what sort of guarantee that vendor is offering should the draft be altered prior to final ratification.

Ethernet is the most popular networking method, although many industry analysts have predicted that it will be surpassed by Token Ring in the 1990s. With the final ratification of the 10BASE-T standard, Ethernet will become a formidable competitor in price, ease of installation, reliability and features.

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Voice E-mail

People love to find new ways to communicate. Just when many people thought or hoped that computers, networks and electronic mail would produce the longed-for 'paperless office', desktop publishing and fax machines gave us all new means of expression and buried us in even more paper.

As the electronic communications systems in our society evolve, they don't displace one another — we just communicate more than ever. Making direct telephone contact hasn't gone out of style, but other electronic means of communication have augmented telephone conversations for many people.

Electronic mail, over local area networks or even international services like MCI Mail, is useful for workgroup-wide communications. Voice-mail systems that answer incoming calls, store messages and forward them on demand often eliminate the need for real-time conversations. And fax has a breezy simplicity that reduces the technical threat implicit in other forms of electronic communications.

Now, a new twist in communications has come to LANs: voice E-mail. This isn't the typical voice mailbox you encounter when you phone people.

Today's voice E-mail products — Artisoft's LANtastic and Wang's Freestyle System — aren't connected to the telephone system. Instead, voice E-mail is an augmentation to electronic mail systems; it carries voices, music and other sounds across a LAN. Products for large commercial mail systems aren't available yet, but there is no reason why this technology can't also apply to IBM's Profs and all other types of large electronic mail services.

A talking network

Why would you want to hear voices over your network? Because, as humans, we used verbal expression years before we began writing, and for many people verbalising is easier and more satisfying than jotting thoughts down on paper. Speaking potentially evokes greater emotion, conveys greater sincerity and promotes a higher level of trust than writing.



Frequent E-mail users invent symbols, such as the sideways happy face :-), to help others understand written humour. Aside from these artificial means, however, most people have difficulty shading their written words the way they do their speech. Cynical comments that sound humorous in speech can come across as insults in text.

The second — and more practical — answer to the question 'Why voice E-mail?' is that there are several interesting applications we can point out today, and even more that creative minds will discover tomorrow. Today's list includes:

- Attaching a verbal explanation to a spreadsheet or report. Wouldn't your spreadsheets 'speak for themselves' if people viewing them heard your voice explaining each line of numbers as it scrolled across the screen? You can do

With the incorporation of useful new technology into the LAN communications scene, voice E-mail systems allow you to play back E-mail messages, transmit voice messages or verbally annotate a cumbersome spreadsheet for a co-worker — Frank Derfler explains.

this with Wang's Freestyle System. With Freestyle, explanations sound from a speaker as numbers flow across the screen. The Application Program Interface (API) available for Artisoft's LANtastic lets developers build voice capability into their own applications running on any NetBIOS network.

- Sending quick voice messages across the network to specific persons or to a mailing list. Executives still saddled with keyboard phobia — often a condition of perceived status rather than a neuromuscular limitation — can dictate their thoughts to a PC for transmission.

- Having your PC read your E-mail messages to you. Not currently available on either LANtastic's or Wang's offerings yet, a package available now in the US, VoxMail, for example, does text-to-speech conversion. So even messages that aren't created as spoken text can be converted. This capability allows you pace the floor, practise putting, or simply rest your eyes while still receiving your E-mail. Obviously, this is a great ad-

vantage for persons with visual limitations.

- Sending music and other sounds across the network. We have central databases of written words and numbers, and there are databases of images commonly used in security and real estate applications, but the concept of databases for sound is new. Many types of businesses (commercial broadcasting, for example) need the ability to quickly search and retrieve sounds, and then edit and manipulate them in digital form. The two products in this review move high-quality sound across a network of PCs. We aren't aware of a database of sounds yet, but all the pieces are here. Someone could create a commercial audio database product in a matter of days.

By the way, let us know when the first computer bulletin board service for exchanging music comes online — it could grow more popular than 0055-number talk lines. Is this the beginning of the end for FM radio?

Total integration

Some responsible for marketing these products paint grand pictures about PCs becoming the central point for all voice, data and fax communications. They talk about generating messages by local voice, telephone link, keyboard, or fax on one end and receiving the message on the other end(s) in any desired format, regardless of how it was created.

The products we reviewed bring this technology a lot closer, but having the technology and getting people to buy it are two different problems.

Four years ago, the integration of multi-line telephone and PC systems as a product idea seemed a natural. Six companies, Compaq among them, designed sharp looking and highly functional products using the power of the PC to initiate, schedule, queue, and conduct both voice and data communication.

But no matter how great the power of the PC and the multi-line telephone might be as standalone devices, these

More than an expensive answering machine

Music CDs started the digital voice revolution, and what followed was a flurry of development in many areas of digital recording — including something as seemingly unrelated as voice E-mail. From mini to microcomputers, users and developers are finding new ways to use this technology. Still, most people take the way computers handle voice communications for granted.

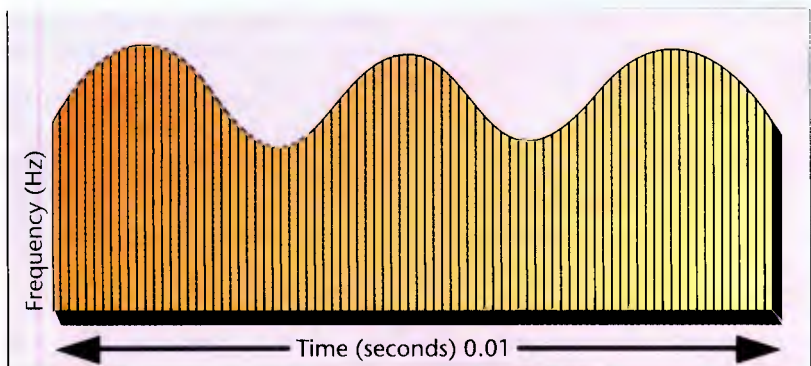
The process is complex, requiring plenty of computing power. Special analogue-to-digital and digital-to-analogue

converters (ADCs and DACs) must transform analogue speech to the digital ones and zeros that the computer can understand. Here's how it works. A voice waveform is recorded digitally by a periodic sampling of the waveform through an ADC. The quality of speech that can be generated with this approach varies with (1) the rate at which samples are recorded (appropriately called the sampling rate) and (2) the number of bits the ADC uses to represent a sample (the resolution).

The challenge here is that the analogue signal representing the voice is continuous; a computer must find a way to change the continuous waveforms into binary numbers. In digital speech recording, a computer attempts to approximate the speech signal through frequent sampling of individual points in the analogue wave with an ADC. It converts that sample into a number corresponding to a percentage of the maximum possible value of the speech signal. The higher the maximum possible number, the lower the

A sound sampling for voice E-mail

This diagram explains how Adaptive Differential Pulse Coded Modulation (ADPCM) stores speech in binary form. The speech is sampled 8000 times per second, then each of the 8000 points is converted to a number associated with the difference of modulation from the previous point. Comparing each new point with the previous point requires only four bits of information instead of the eight bits required for the modulation relative to zero. This conserves disk space by storing half the information. The sine wave represents 1/100 of a second of speech and shows where the 80 samples in time are recorded.



products flopped when companies packaged them together and tried to sell them. Standalone fax machines and multi-line telephones lose a lot of appeal when mixed with even the friendliest PC interface, so don't look for total integration of these systems soon.

Sound to data and back again

In essence, these products combine voice encoding and decoding with standard electronic mail systems. They use special hardware, called digital-to-analogue (DAC) and analogue-to-digital (ADC) converters, to change sound into a stream of digital zeros and ones (see the textbox 'More than an expensive answering machine'). Modern integrated circuit techniques reduced the price of the components and made designing DA and AD adaptors easier than it was in the past. The Artisoft adaptor costs \$245 each.

The size of the data file created by encoding one minute of spoken text depends on the sampling rate of the AD

converter and the speech rate of the speaker, but for E-mail it is generally around 100K per minute. Higher-quality sound can easily take twice that amount. Once the sound is in digital form, it's easy to play back and edit. You can roll the file back to a particular byte to change pitch, reduce spacing between bursts of sound and edit sounds in other ways.

Of course, once the text is in digital form you can move it over communications channels and call it into memory just like any other data file. As an E-mail message, the file containing the sound moves across the network just as a database or spreadsheet file does. When it's time for the PC to generate audio from a certain portion of the file (for example, when someone scrolls across a specific cell of a spreadsheet), a simple program reads a portion of the file from disk and sends it to a DA converter. The converter, hooked to a speaker with better volume and sound quality than the one in your PC, gives a faithful reproduction of the input — after any editing.

error in the digital representation. Likewise, the greater the sampling frequency, the more the digitised speech sounds like human speech.

The computer reconstructs the signal by sending the data to a DAC. The DAC converts the digital data back to analogue voltages. Sending the data to the DAC at the same frequency it was recorded results in an approximation of the original waveform. If the accuracy of the ADC's resolution and the sample frequency are high enough, the human ear will have a hard time telling apart the computer-generated voice and the real thing.

One of the most important considerations in designing a voice recording system is the compromise made between the quality of sound produced and the quantity of data required to reconstruct the voice. Higher sampling rates and greater resolutions require more disk space. The total number of bits required to store a message is calculated using the formula: 'bits of disk space = sampling rate by resolution by length of message'.

For example, a 20-second voice message collected at the typical rate of 8000 samples per second with a resolution of 12 bits, requires 1,920,000 bits or 240,000 bytes of disk space. Conversely, the same message at 4000 samples per second with a 6-bit resolution requires only 60,000 bytes, but it won't sound nearly as good.

For speech reproduction, a sampling rate of 4000 to 8000 samples per second and a resolution of eight bits is adequate for most applications. But storage requirements add up fast. Using the above for-

mula, a 20M disk stores only 42 minutes of voice.

Fortunately, well-known data-encoding techniques exist to cut down — by a factor of two or more — the number of bits actually stored. The most common technique is Adaptive Differential Pulse Coded Modulation (ADPCM). With ADPCM, instead of storing the complete digital encoding of the speech signal, the only information stored is the difference between the present and the previous sample. By using ADPCM, it is possible to record eight bits of information in four bits.

ADPCM got its name because the analogue value associated with the four bits stored will vary depending on the magnitude of the previously recorded signal. Even the magnitude of the difference in signals represented by the four bits varies depending on previous values of the input signal. The software uses the same algorithm in reverse to output the data for reconstructing the original speech signal.

Various manufacturers implement this process differently. Some, like Dialogic, use the Intel 80188 processor; others, like Natural Micro Systems, use the TI 32010 digital signal processors; and still others, like Artisoft, have no on-board processor but keep costs low by letting the PC do the work.

Each design has its own advantages. When cost is a primary concern, the Artisoft card does a good job with voice, but needs CPU power. An on-board processor design, like Wang's Freestyle System, provides better performance but at a higher price.

Keith Thompson

As you'll see in the reviews, these two products have substantial differences. Wang's Freestyle System requires a dedication to its own software architecture, but it has a long list of unique capabilities, while Artisoft's approach is to start the technology blossoming by delivering good performance at a low price.

The integration of sound and text is in its infancy. Now is the time for creative system developers to climb on board and find new ways to sell interesting products.



Leonardo DaVinci might have called it a work of art. If you appreciate fine art, you'll love Artisoft's sleek voice communications system that allows network users to send and receive electronic voice mail.

Artisoft bundles voice mail capability into its LANtastic network operating system and has kept the voice adaptor card's price at a low \$245. While the voice and LAN systems work well together, you're not required to have one with the other. You could use the voice adaptor without the network and transmit files of digitised voice via modem or mail them on disks.

If you choose to buy the LANtastic network operating system including the software to drive the voice adaptor card, you can get it in several ways. If you buy a LANtastic starter kit for Ethernet or for Artisoft's proprietary 2Mbps operating system, you get the LAN adaptor hardware and software bundled together.

You can buy the operating system software that will run with many NetBIOS adaptors and provide full network services for \$802 (prices vary according to the number of users). Every voice-capable PC needs a voice adaptor card and the LAN hardware and software.

Software developers who want to integrate Artisoft's voice communications feature into their products can purchase a Voice Programmer's Interface. The price for this has not yet been set, but will be in the vicinity of \$300. A set of voice

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Voice E-mail: suitability to task

The voice E-mail systems we reviewed showed more differences than similarities: LANTastic is first a network; it offers support for voice E-mail among its other functions; Wang's Freestyle, on the other hand, interacts with existing applications and allows you to capture, annotate (with handwritten or spoken text) and transmit screens.

But since voice E-mail is the one feature the two products do have in common, we provide the subjective ratings below to help you choose which product may be right for your particular needs. Compare them with the product reviews for a complete picture of what each product offers.

The tasks

Each voice E-mail package is rated according to its usefulness in four areas that cover the gamut of primary workgroup tasks. The first rating, 'Large workgroup communications', evaluates how well the product handles various communications used by large organisations. These in-

Product Name SUITABILITY TO TASK	
Large workgroup communications	
Integrated voice with applications	
On-the-road access	
Integrates into existing E-Mail systems	

clude communicating with users in your building, across town or even cross-country.

The second rating, 'Integrating voice with applications', reflects how well the product attaches voice messages to spreadsheets, word processing files or databases. Ideally, the application displays the information on the screen at the same time it plays the voice message through a speaker, so, the recipient can more closely follow the flow of data.

The third, 'On-the-road access',

determines how well the product integrates voice E-mail into a business traveller's daily routine. Can the person on the road access these voice messages painlessly?

Products can offer direct communication into E-mail programs, or send voice files only as attachments. Thus, the fourth rating, 'Integrates into existing E-mail systems', determines how easy it is to add the product's voice E-mail capabilities to your own E-mail system.

Note that in the 'Integrating voice with applications' category, LANTastic receives the highest possible score for its developers' API. With this package, application developers can create add-in or built-in functions to insert verbal messages in the middle of a program.

The ratings

0 Completely unsuited for the task

1 Poor

2 Good

3 Very good

4 Excellent for the task

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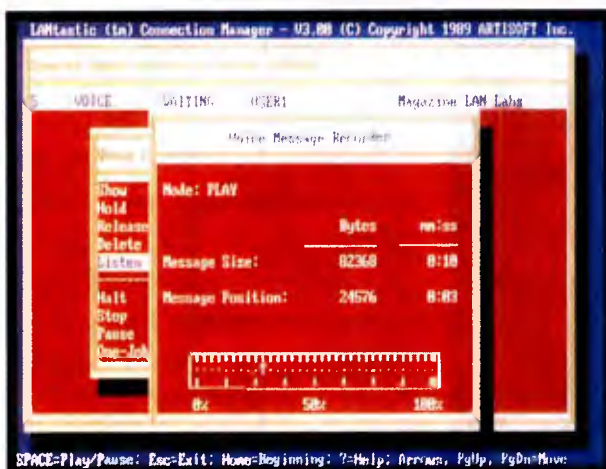
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LANtastic uses layers of windows to provide control and maintenance options.

The pointer display shows your location in a recording session or during playback. Other windows control the status of recorded messages



programming system calls makes it possible for programs to use the LANtastic voice adaptor card to record and play digitised sound. LANtastic's operating system isn't difficult to install; you simply load the software and adaptor cards into your PC and make sure the necessary card drivers are installed correctly. Electronic messages will guide you through the installation.

The voice E-mail package helps you create, erase, rewind, forward and pause voice mail messages. You select the voice communications route you wish to take — Mail or Chat — from LANtastic's main menu list; create and send your message; and either pick up your handset or turn on your speaker box. The voice adaptor card distributes the voice data through

an RJ-11 phone connection located on your voice adaptor card.

Artisoft includes a telephone handset with each voice adaptor card. While this is the primary way you'll record and play back messages, a separate output jack on the adaptor can feed one of the small amplifier/speaker combinations designed for higher-quality sound.

Analogue to digital

The LANtastic voice card translates analogue sound into digital format in your PC. The system has an audio bandwidth of 200 to 3400Hz — far from high fidelity but slightly better than the best telephone quality. Being a digital system, it avoids the cumulative noise found in standard analogue telephone systems.

Once digitised, your data is treated like any other file stored in the PC. You can send it out through a modem or through the E-mail LAN. On the receiving end, another voice card translates the digital file back into sound so the person at the receiving machine can hear the message.

You can opt for a voice-compression mode that reduces the size of your voice files by about 50 per cent, which can save time when you have a large file of digitised sound to transmit. There's some distortion of the voice pattern when you play back your message after compression, but it's not enough to deter you from using the mode.

The Chat mode of the LANtastic operating system lets you conduct a real-time two-way telephone discussion across the network using the voice adaptor boards. However, there is a significant delay due to the transmission process. Most people will find the real office telephone system more responsive, although the Chat mode has some potential in training situations.

Menus ease operation, and online

help screens assist if you have problems. You can choose between the Mail Services option or the Chat mode. Under the Mail Services option, you can send a voice message or save an entry to a specified disk file. Choose from a list of recipients and send multi-address messages. Also, a pop-up E-mail notification alerts a workstation of incoming E-mail. You get separate notifications for digitised sound and standard data messages.

The voice recording and playback screen in the LANtastic E-mail system deserves a special mention. This screen includes a pointer — like the mechanical pointer on a dictating machine — that shows your location in the recorded message and offers excellent rewind, reply and editing capabilities.

This voice communications feature within Artisoft's LANtastic makes the product a unique entry in the LAN market. The ability to send voice inexpensively over LAN cabling may sound futuristic, but it's available today.

Wang Freestyle System



Computerphobia is one of the biggest production problems facing business today, and Wang targets Freestyle toward large organisations that want to keep training costs low and productivity high.

Designed to let you work 'with' a computer the way you do without one, Freestyle runs on the Wang PC 200/300 Series and AT compatibles, and combines voice input, an electronic tablet with a special pen, great graphics and software into one package aimed at helping people use a computer without modifying their work habits. Freestyle and LAN Office go far beyond voice E-mail functions, but for this review we're concentrating only on those capabilities.

Freestyle interacts with existing applications and allows you to capture screens, annotate them with handwritten text and speech, and then send them off through various electronic mail systems. During demos, the Wang representatives used the Freestyle software

At a glance

LANtastic

Distributor:	Digital Solutions
Telephone:	(07) 883 1861
Price:	Voice adaptor, \$245
Requires:	256K RAM, LANtastic network operating system; NetBIOS-compatible LAN adaptors (if used on a network), DOS 3.1 or later
In short:	Artisoft's voice-mail program, built into LANtastic's network operating system software and combined with the vendor's voice adaptor card, makes it easy to create and replay voice messages — a network is not required. A Voice Programmer's Interface is available for adding voice to software applications.

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S1393 - Diskette Manager V2.1 A useful disk cataloging program.

S1495 - Alice In Wonderland An adventure game based on the book. Suitable for ages 9 years and up.

S646 - Amy's First Primer V1.5 Six games to teach basic skills to the pre-reading child.

A397 - Family Tree V41.0 Create your own family tree using this simple menu driven software.

S1236, S1237, S1238 - PC-File (3 Disk Set) V5.0 An upgraded version of PC-FILE:db. This program includes a data base and graphics capabilities for graphs, and is entirely menu driven.

S1220 - Dracula In London V1.03 An adventure game with excellent

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S1406 - Sierra GamesUnprotect V2.00 Removes copy protect from most Sierra on-line games.

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Using the electronic tablet included with Wang's Freestyle System, users can add a signature or notes to a displayed page. The symbols across the top — familiar to any VCR owner — let you control speech functions like playback and rewind

4-12-98 2:16 PM

1. The Director's SAP!

Expenses					
Manufacturing Costs	\$0	\$35	\$70	\$49	\$153
Royalties @ 12%	\$0	\$1,292	\$2,584	\$1,848	\$5,717
License Fee	\$1,000	(\$1,000)	\$0	\$0	\$0
Gross Profit	(\$1,000)	\$0,610	\$15,867	\$12,778	\$36,255
R & D Development	\$210	\$12	\$0	\$6	\$236
Selling G & A	\$0	\$1,454	\$2,908	\$2,870	\$6,431
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Maintenance	\$0	\$6	\$6	\$6	\$18
Support Expenses	\$0	\$485	\$1,454	\$2,144	\$4,082
Net Profit	(\$1,210)	\$5,750	\$9,933	\$7,444	\$21,918
Net Margin %	N/A	64.38%	53.60%	58.88%	52.88%

Changed to 11% please have new numbers ready for Tom by 4:00 PM

12-Apr-98 01:47 PM

(called Freestyle Light) to grab a spreadsheet from the screen, circle and draw arrows to various numbers in the spreadsheet using the electronic pen and tablet, and dictate a verbal description of what the numbers meant. A touch of the pencil on an icon sent the spreadsheet, with spoken and handwritten annotations, to a recipient chosen from a mailing list.

When the recipient gets the E-mail

message, Freestyle plays it back at the same rate it was recorded. The recipient doesn't just get a single graphic on the screen; instead, the presentation unfolds in the same logical sequence.

Pricing the system

Freestyle's price depends on what you need. We equipped two PCs with the Freestyle software and hardware, includ-

ing two tablets, two voice interfaces with speaker phones, two LAN Office nodes, LAN Office and a scanner. The list price for this configuration is over \$8000 — in addition to the PCs needed to run everything. Wang prices the Freestyle components for each additional workstation at \$1900 without the \$2940 scanner.

Another cost factor is that LAN Office requires a server dedicated to distributing mail to workstations. The mail server queues mail from all the nodes and distributes the mail to local users or, through a gateway to remote users.

The original Freestyle system ran only on Wang hardware and the company's own network; the current version supports several third-party products: Banyan's VINES, Novell's NetWare, 3Com's 3+Share and 3+Open, and IBM's PC LAN. Support for other third-party products remains distant.

Installing Freestyle

Even though Wang supplies good documentation, installation and setup aren't simple. Each piece of hardware requires a 16-bit AT-compatible expansion bus slot. Users with crowded ATs

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must take care to allocate interrupts and I/O address locations when installing all three cards.

We recommend checking your AUTOEXEC.BAT file after the supplied FINSTALL program completes the installation process to make sure everything is in the right place. It took a considerable amount of help from the Wang technical support staff to get everything working, but things became easier once installation was over.

Since Freestyle uses multi-dimensional data (text, graphics and voice), storing numerous documents requires many megabytes of disk space. Freestyle stores all the information associated with a document in separate files.

The graphics and voice files occupy the most disk space — for the latter, it's 4K per second with silence compression. In other words, a five-minute message, with a total of 20 seconds of silence between words, takes up 1M of disk space. Wang assumes you'll use the system to handle all your daily tasks. If you do, you'd better own a hard disk farm.

Representation of desk

The Freestyle System's screen is a representation of your desk, with an icon for certain functions you might use every day. These include a filing cabinet, folders, mailbox, fax machine, printer, scanner and trash can. You create documents using these tools, just as you would without a computer.

When you touch the special electronic pencil to the tablet, Freestyle quickly swaps all of your running programs to disk and loads itself. Since Freestyle stores so much away, you have to set up network drivers so the program can't unload them; otherwise it won't find the network resources it requires. Surprisingly, despite its complicated nature, Freestyle works with most popular applications, including Microsoft Windows 2.1.

Freestyle takes a picture of the screen when you touch the pencil to the tablet; this image is the basis for all communication. Graphic buttons, resembling those on your VCR, appear on the top line of the screen to control the speech functions. You start recording voice as you use the pencil or keyboard to enter information.

To send the finished file, you drag it to the mailbox and select one or more recipients. When the addressees get their mail, Freestyle plays the sound back through the speaker phone and shows notations on the screen at the same rate at which you created them.

The technical quality of Freestyle is excellent. Voices sound completely natural and better than local telephone quality. The visual presentations are easy

At a glance

Wang Freestyle System

Distributor: Wang Computer
Telephone: (02) 925 5058
Price: LAN Office, \$1340 per server; Freestyle Light, \$420; tablet, \$980; scanner with software, \$2940; voice option with speaker phone, \$920

Requires: 640K RAM; AT-class computer or better; Banyan VINES, Novell NetWare, 3Com's 3+Share or 3+Open, or IBM PC LAN; LAN Office, Freestyle Light, LAN Office workstation licence and Freestyle Voice option; DOS 3.2 or later

In short: An innovative office information management and communications tool. More of an entire office automation system than a voice E-mail system, Freestyle smoothly implements LAN voice E-mail. Intended primarily for large organisations with many computer novices.

to use. And those of you prone to mousing will be happy that Wang has recently included mouse drivers in the software. Using a mouse instead of the tablet can considerably reduce the system's cost, although it won't do much for your on-screen penmanship.

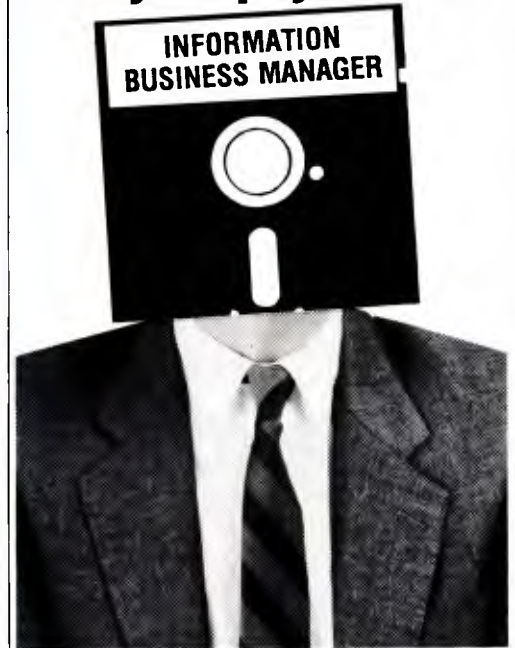
The Freestyle phone and address book contains the transport information for each person with whom you communicate. Some have fax machines, others are connected to the LAN, and still others are connected through a gateway. As you send documents, the Mail system knows about each person's address and sends the documents accordingly.

Freestyle is a great product built on a fascinating concept. The voice E-mail is extremely useful and a cinch to operate, although the product needs more support for third-party scanners, fax cards and digitisers.

Initial price and hard disk consumption put this system beyond the reach of people with limited budgets. But if your accountants value productivity and creativity, you may be able to justify the costs.

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Trim the branches of your directory trees

Most of us add directories and subdirectories as the need arises, giving little thought to the tangled mass of branches that eventually results. We know that an efficient filing system requires a well-designed disk directory structure, but we'll tidy up the organisation 'later'.

Reorganising an existing directory structure using DOS command is no easy matter, however. It involves making new directories, copying files, deleting old files and finally removing old directories. It's a formidable, laborious process, full of potential for disastrous mistakes. Indeed, if the disk is nearly full, there may not even be room to copy or move the files around. So we put off reorganisation and put up with a filing system that only Radar or Klinger could understand.

In contrast to DOS procedures, this issue's utility, PRUNE.COM, makes directory management not only easy, but pleasurable. PRUNE presents your directories in a logical graphic tree configuration and then lets you move, copy, delete and rename directories or entire branches of your directory tree, using an intuitive point-and-shoot interface. You can also lop off entire branches and graft them onto a different branch or even a different tree on another drive. And integrated with PRUNE are functions to call up two of my previous file management utilities, DR and DIRMATCH, with which you can examine and update the contents of your directories before manipulation.

The program and its source code is available for downloading from APC MAGNET on Telecom's Discovery 80; alternatively you can send in a blank, formatted, 360K 5.25in disk with a stamped, self-addressed package to July Productivity, 122 Ormond Road, Elwood 3184. (In addition to PRUNE, we'll send you DR and DIRMATCH incase you don't already have them.)

To create an executable from the source code requires using a macro as-

sembler (IBM or Microsoft, version 2 or later) and the following commands:

```
MASM PRUNE;  
LINK PRUNE;  
EXE2BIN PRUNE PRUNE.COM
```

PRUNE syntax

The full syntax for PRUNE is simply

```
PRUNE [d:] [d:]
```

Entering PRUNE without either of the optional drive arguments (d:) will display the directory tree of the current drive in two identical side-by-side windows, as shown in Fig 1. To display a drive other than the default, just enter that drive as the first optional drive. If you want to manipulate two drives simultaneously, specify both; the first will appear in the left window. For example, if the current drive is C:, entering

```
PRUNE A: D:
```

will display the A: drive tree in the left window and that of D: in the right. You can also change the displayed directories once PRUNE is running.

When PRUNE first comes up, the active tree is in the left window. The active tree

What lopping shears and grafting tools do to uncontrolled growth in your garden, PRUNE can accomplish for your hard disk.

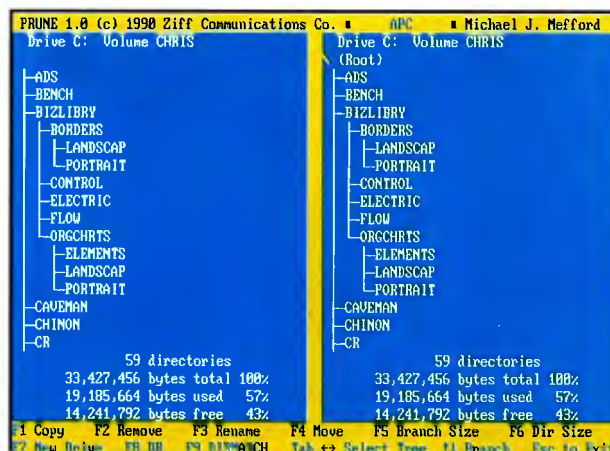


Fig 1 If no initial drive letter is supplied, PRUNE displays the directory tree of the current drive both in its active (left) and its inactive (right) windows. The program lets you copy, move, remove, rename or graft directory branches either within the directory tree of its own drive or that of any other drive on the system

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is displayed in white, with the directory selection bar initially on the \ (Root). The inactive tree on the right is shown in light grey. You can toggle back and forth between the two windows, making each the active window alternatively, by using the Left and Right Arrow keys or Tab key.

The remaining keypad navigation keys (Up Arrow, Down Arrow, PgUp, PgDn, Home and End) move the highlight bar through the directory tree in the active window. You can exit from PRUNE at any time by pressing Esc.

Each level of the tree is displayed in alphanumeric order. You can quickly select a directory by pressing the alphanumeric key for the first letter of the directory name. Successive presses of the same key will take you forward through all the directories that begin with that letter.

Any hidden directories will display the letter H to the right of the directory name. PRUNE lets you operate on (and even remove) hidden directories just as if they were normal directories.

Pruning your directories

The function keys control the operations you can perform on your directories with PRUNE. You simply select a directory with the highlight bar and then press the desired function. It's important to realise, however, that Copying, Moving or Removing a directory affects not only the highlighted directory, but all of that directory's dependent subdirectories as well. This is easy to remember if you think of the directory structure as a tree. You can't stand out on a limb of a branch and cut off that branch without precipitating yourself (and it) to the ground.

Thus, for example, if you have a disk tree that looks like

```
C: \ (Root)
  |
  |--- TEMP
  |
  |--- DOC
```

and you remove the TEMP directory and its files, you will also remove TEMP's subdirectory DOC and its files. To suppose otherwise would require being able to leave the DOC directory magically suspended in air without support. PRUNE will not let you copy, move or remove the root directory.

What follows is a summary of the function-key command operations:

- **F1 (Copy)** To copy a directory, its files and any subdirectories it may have, highlight the directory and then press F1.

A right arrow symbol will appear to the left of the selected directory and PRUNE will ask you to highlight the destination

directory for the branch. Use the navigation keys to highlight the desired new parent directory for the branch. The destination can be a directory in the current active window or, if you hit Tab (or the Left or Right Arrow key, as appropriate), the destination can be a directory in the inactive window — even if that directory tree is on a different drive.

Press Enter when the destination directory is highlighted. PRUNE will then ask you to press Y to confirm and start the copying process. Press N, Esc or any other key to cancel. PRUNE will not start the copy process if there is not enough disk space to finish.

PRUNE will not copy a directory if the

•PRUNE comes interlinked to two other PC utilities which can examine and update the contents of your directories before manipulation. •

destination directory has an existing file or subdirectory with the same name.

- **F2 (Remove)** Press F2 to remove the highlighted directory and any subdirectories of that branch, together with all their files. Pruning old dead directories is necessary to make room for new growth. Since removing the wrong branch through error can be such a serious matter, however, PRUNE warns you with a beep and a message. You are then required to confirm by pressing Y and Enter before the pruning process begins.

Use F2 with care. If you're not sure what a branch contains, use the DR utility (described below) to inspect its contents before pruning. If for some reason you do inadvertently lop off a valuable branch, stop your session with PRUNE immediately and recover your files with one of the file-rescue utilities, such as The Norton Utilities or Mace Utilities.

- **F3 (Rename)** After pressing F3, you can type in a new name for the highlighted directory. A directory name can have up to eight characters and a three-character extension. Extensions, however, are not usually applied to directories.

- **F4 (Move)** Moving directories around to rearrange and rationalise your filing system is the most powerful function of

PRUNE. The procedure for moving a directory is the same as that for using the Copy command (F1) described above. Highlight the directory you wish to move; press F4; and highlight the new parent for the directory. The only difference between Copy and Move is that the old branch is removed from its previous parent.

When moving a directory from one drive to another, PRUNE automatically performs two steps. First the directory is copied to the new location and then the old directory is removed. You must remember that all the dependent subdirectories and files will come along with the moved directory.

Moving a directory around within the same drive is a completely different process. No files are actually moved: only the pointer to the parent of the directory is changed. You might think of this simply as rearranging the lines that link the tree diagram without moving the names.

Although a complicated procedure, moving directories around on a single drive involves very little disk activity. It is thus very, very fast. You can move hundreds of files in a directory to a new parent in the blink of an eye. Further, you can move directories around even on a full disk. For a more in-depth explanation of how this works, see the 'Dot and dot-dot' section below.

You cannot move a directory to its parent nor to a lower limb on its branch. Thus, if you have a tree

```
C: \ (Root)
  |
  |--- APC
  |   |
  |   |--- DOC
  |   |
  |   |--- TEMP
```

you cannot move APC to the root directory, its parent, because it is already there. Nor can you move APC to DOC, since that doesn't make any logical sense. You could however move APC to TEMP.

- **F5 (Branch Size)** This command returns the number of cluster bytes used by the highlighted directory, its files and any dependent subdirectories. Cluster bytes represent the space actually used on-disk by the branch which is invariably larger than just the sum of the file sizes.

Disk space is allocated in chunks called clusters. A typical cluster size is 2048 bytes. Any file with a size between one and 2048 bytes will use up the same amount of disk space, that is, 2048 bytes. PRUNE uses the branch size to determine whether there is room to copy or move a branch to a different drive.

On a crowded disk, checking a branch size will quickly help you decide which

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branch to prune in order to get some elbow room. You should use branch size in conjunction with the current free bytes on the disk displayed at the bottom of the directory listing. Incidentally, the total bytes, bytes used and bytes free shown in the active window are also counted in terms of cluster bytes; this is the same procedure used by CHKDSK.

● **F6 (Dir Size)** The directory size report is very similar to the branch size report, except that it applies only to the high-

lighted directory and does not include any of its subdirectories. If a branch doesn't have any subdirectories, then branch size and directory size reports will be the same.

● **F7 (New Drive)** Pressing F7 allows you to load a new tree and display it in the active window. Simply enter the new drive letter; no colon is necessary.

● **F8 (DR)** DR is a popular file manager utility I wrote some time ago (it appeared

in APC September, 1987) that, among other things, lets you call up and read the files in a directory. By pressing F8 you can shell out from PRUNE and run DR. DR.COM must be in a directory included in the DOS PATH statement. If you have a floppy-only system, you will also need to have a copy of COMMAND.COM, along with DR, in the boot floppy drive.

Inspecting a directory with DR is an excellent way to confirm that a directory you are about to remove does not contain any important files. The directory loaded

Customising PRUNE

Some systems, especially laptops, don't display colour contrasts very well. If you find PRUNE hard to read, you can force it to use black-and-white attributes by entering the command MODE BW80 before running the program. The best way to do this is from a batch file containing the lines

```
MODE BW80
PRUNE %1 %2
```

If you have a colour system and PRUNE is using black-and-white attributes, chances are that some other application has changed the video mode. To encourage PRUNE to use colour, issue the DOS command

```
MODE CO80
```

before running the program.

Modifying PRUNE.COM

The following instructions will enable you to customise the colours used by PRUNE. It will also enable you to change the program run by pressing F7. Start by making a backup copy of PRUNE.COM and then enter

```
DEBUG PRUNE.COM
```

You are now ready to modify the utility. If at any time you make a mistake, simply abort the editing process by entering Q. The last

two commands that you enter after entering any modifications are

```
W
Q
```

for Write to disk and to Quit DEBUG.

Colour scheme

The screen shown below is annotated in order to show the colour descriptions and their values. To change the colour, enter the corresponding DEBUG instruction by replacing xx with an alternative hex colour value from the following list:

Dark colours

0 Black
1 Blue
2 Green
3 Cyan
4 Red
5 Magenta
6 Brown
7 Light grey

Light colours

8 Dark grey
9 Light blue
A Light green
B Light cyan
C Orange
D Violet
E Yellow
F White

It is also possible to change the colour of DR. The default is light grey on blue (17h). To change it, use the instruction E 17F xx.

The background colour number is entered for the first x and the foreground colour for the second x. Do not use a light

colour for the background, or the display will blink.

For example, to change the bar colour from blue on cyan (31) to blue on green (21) we entered the following:

```
E 57A 21
```

PRUNE turns on the border, and some monitors can't handle that. In order to disable the border, enter the following instruction:

```
E 185 1
```

Replace the 1 with a 0 to re-enable the border.

Reprogramming F7

Pressing F7 in PRUNE will run the DR.COM utility if it is found on your DOS PATH. To substitute a different utility for DR, enter

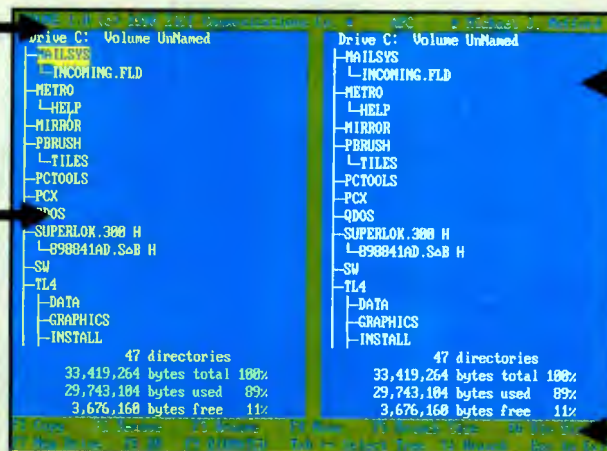
```
E 192 "12345678"
```

Where 12345678 is the eight-character name of the utility you want to use instead. Make sure to include the quotes shown above, but do not add either the period or the extension (.COM or .EXE) of the alternative utility. Append spaces if the utility name is less than eight characters.

Michael Mefford

Menu colour
(default: blue on light grey
71h)
changed to blue on green
with E 17B 21

Active tree
(default: white on blue 1Fh)
changed to yellow on blue
with E 17E 1E



Inactive tree
(default: light grey on blue
17h)
changed to white on blue
with E 17C 1F

Menu bar
(default: blue on light grey
71h)
changed to blue on green
with E 17D 21

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into DR will be the currently highlighted directory in PRUNE. If DR is not found on your path, you will get a brief DOS 'Bad Command' message, after which PRUNE will reread the disk and pop back up. If you don't have DR, you can download it from APC MAGNET.

● **F9 (DIRMATCH)** DIRMATCH, one of my more-recent file management utilities, displays the files in two directories side by side and lets you update the target directory with files from the source directory. When you press F9, you will be prompted to highlight the first (source) directory for DIRMATCH to display. Press Enter to select. Do the same for the second (target) directory. The two directories can be on different drives if PRUNE's windows are of different drives. As with DR, DIRMATCH must be found in the DOS PATH. Again, if you don't already have it, you can download DIRMATCH from APC MAGNET.

PRUNE supports various popular video

modes, such as the EGA 43 line and VGA 50 line. If you find PRUNE's colour scheme difficult to read or just prefer different colours, see the textbox 'Customising PRUNE'.

Caveats

Unless you have remarkable patience, I suggest that you not copy or move directories across two different floppy disk drives. Depending, of course, on the size of the move or copy, the process can be lengthy. And it's worse if you have only one physical floppy disk drive: the swapping of floppies as each file is copied or moved will drive you crazy. If you need to do so, copy the branch temporarily to a hard disk and then move it to the desired floppy.

If you use multi-tasking software, such as DESQview, 386MAX or Microsoft Windows/386, don't switch to another task while PRUNE is working. Giving control to

another application that does disk I/O while PRUNE is in the middle of modifying the directory structure could cause fatal disk problems.

Note also that PRUNE may be incompatible with some virus-protection programs. The reason for this is that PRUNE uses direct sector disk access, which can cause protection programs to scream in anguish.

The programmers' corner

After BATCHMAN was published (APC February 1990), I made a discovery that bears also on PRUNE's operation, which I'd like to share with the programmers among our readers. BATCHMAN's Qformat function uses the DOS disk direct sector access interrupts 25h and 26h. Qformat reads a disk's directory and FAT sectors and writes them back as zeros. This effectively frees all of the disk space — the equivalent of a quick format.

PRUNE.BAS

[illegible]

890	DATA	74	6F,	72	79,	2E,	0,	44,	69,	72,	65,	63,	74,	6F,	72	79,	20	5D1
900	DATA	6E,	61,	6D,	65,	20,	61,	6C,	72,	65,	61,	64,	79,	65,	65,	78,	69,	6D9
810	DATA	74,	73,	2E,	0,	53,	75,	62,	64,	69,	72,	65,	63,	74,	6F,	72,	79,	614
820	DATA	20,	63,	72,	65,	61,	74,	64,	69,	6E,	20,	65,	72,	72,	6F,	72,	3B,	5FA
830	DATA	20,	43,	61,	6E,	27,	74,	20,	70,	72,	75,	6E,	65,	2E,	0,	4C,	6F,	500
840	DATA	67,	69,	63,	61,	6C,	20,	65,	72,	67,	72,	38,	20,	43,	61,	6E,	5B7	
850	DATA	27,	74,	20,	70,	72,	75,	6E,	65,	2E,	0,	20,	20,	50,	72,	65,	73,	4ED
860	DATA	73,	20,	61,	6E,	79,	20,	6B,	65,	79,	20,	74,	6F,	20,	63,	6F,	6E,	5A7
870	DATA	74,	69,	6E,	75,	65,	2E,	0,	48,	69,	67,	68,	6C,	69,	67,	68,	74,	5EB
880	DATA	20,	64,	65,	73,	74,	69,	6E,	61,	74,	69,	69,	6E,	20,	64,	69,	72,	621
890	DATA	65,	63,	74,	6F,	72,	79,	20,	66,	6F,	72,	20,	62,	72,	61,	6E,	63,	623
900	DATA	78,	20,	65,	72,	65,	20,	72,	75,	6E,	65,	68,	6E,	65,	68,	65,	68,	653
910	DATA	72,	50,	72,	75,	6E,	69,	6E,	67,	20,	69,	69,	6E,	20,	70,	72,	6F,	5BD
920	DATA	67,	72,	65,	73,	73,	2E,	2E,	0,	57,	41,	52,	4E,	49,	4E,	47,	4C,	42A
930	DATA	3A,	20,	41,	6C,	6C,	20,	66,	69,	6C,	65,	73,	20,	69,	6E,	20,	6D,	52A
940	DATA	61,	72,	6B,	65,	64,	20,	64,	69,	72,	20,	41,	4E,	44,	20,	69,	74,	55E
950	DATA	27,	73,	20,	73,	75,	62,	64,	69,	72,	73,	20,	77,	69,	6C,	6C,	20,	5A6
960	DATA	62,	65,	20,	6C,	6F,	73,	74,	2E,	20,	20,	43,	6F,	6E,	74,	69,	6E,	582
970	DATA	75,	65,	3F,	20,	20,	59,	2F,	4E,	20,	0,	50,	72,	65,	73,	73,	20,	47C
980	DATA	45,	6E,	74,	65,	72,	20,	74,	6F,	20,	63,	6F,	6E,	66,	69,	72,	6D,	60F
990	DATA	20,	61,	6E,	64,	20,	73,	74,	61,	72,	74,	20,	64,	69,	72,	65,	63,	5C8
1000	DATA	74,	6F,	72,	79,	20,	62,	72,	61,	6E,	63,	68,	20,	72,	65,	6D,	6F,	62F
1010	DATA	76,	61,	6C,	2E,	20,	20,	45,	73,	63,	20,	74,	6F,	20,	63,	61,	6E,	521E
1020	DATA	63,	65,	6C,	2E,	0,	61,	6E,	64,	20,	61,	6E,	79,	20,	73,	75,	62,	565E
1030	DATA	64,	69,	72,	73,	20,	74,	6F,	20,	0,	52,	65,	6D,	6F,	76,	69,	6E,	5B7E
1040	DATA	69,	65,	20,	66,	65,	20,	65,	72,	65,	65,	65,	65,	65,	65,	65,	65,	5B7E
1050	DATA	20,	61,	6E,	64,	20,	66,	69,	6C,	65,	73,	2E,	2E,	0,	20,	66,	99E	
1060	DATA	69,	6C,	65,	73,	20,	20,	0,	20,	63,	65,	73,	74,	65,	72,	20,	52F	
1070	DATA	62,	79,	74,	65,	73,	0,	52,	6F,	6F,	74,	20,	73,	69,	7A,	65,	20,	5C6E
1080	DATA	69,	73,	20,	62,	79,	74,	65,	73,	20,	75,	73,	65,	64,	2E,			

1 of 3

PRUNE.BAS

```

1520 DATA 8E, 9E, C5, 2, 2E, 6, 9, 2E, 89, 36, D4, 2, 2E, 6C, 13, 8E,
1530 DATA 12, 14, 5E, 8E, 4, 12, E, 1F, BA, 51, 2, 2E, 75, 13, 8A, 36,
1540 DATA 44, 2, FE, CE, B2, 22, 8E, 8, 14, 8B, DA, BF, BB, 1, 8E, BF,
1550 DATA 14, 3C, 1, 74, 57, 80, FC, D, 74, 2C, 86, CA, 3C, 8, 74, 10,
1560 DATA 3C, 20, 76, EA, 81, FF, C7, 1, 74, EA, AA, EB, B7, 14, 8E, DE,
1570 DATA 81, FF, BB, 1, 74, DE, AC, 14, B0, 2E, 8E, A7, 1, B0, 8,
1580 DATA 8E, A2, 14, 4F, EB, C8, 32, C0, AA, EB, B8, 13, BF, BB, 1, 8E,
1590 DATA 16, D4, 2, 8E, 9E, C5, 2, B4, 56, CD, 21, E, 1F, 73, 5, 8E,
1600 DATA 44, 13, 8E, 8, C6, 6, 3E, 3, 1, E9, B3, 0, 8E, F0, 10, 8E,
1610 DATA 91, 12, C3, C7, 6, C1, 6, C9, 6, 8E, EA, 4, 72, 2D, 3A, C4,
1620 DATA 75, 6, 8E, 70, 6, E9, 97, 0, 8E, 56, 3, 72, 3, 8E, 67, 7,
1630 DATA 8C, 8E, 8E, C0, 80, 3E, 3E, 3, 1, 75, E, C6, 6, 3E,
1640 DATA 3, 0, 8E, 22, A, 83, F5, 2, 8E, 1C, A, 8C, 8E, 8E, D8, 8E,
1650 DATA C0, 8E, AB, 10, 8E, 4C, 12, C3, C7, 6, C1, 6, C3, 6, 8E, A5,
1660 DATA 4, 72, 5, 8E, 1B, 3, 8E, 57, 8E, 94, 10, 8E, 35, 12, C3, 8E,
1670 DATA 8E, 8E, 2, B, C0, 75, 8, BE, F4, 3, 8E, 32, 9, EB, 70, 8E,
1680 DATA 15, 8, 8E, 36, 8, 8E, 44, 9, BE, 19, 5, 8E, 60, 12, 8E, B5,
1690 DATA 12, 8E, 13, 8E, D9, 13, 3C, 15, 75, 54, 8E, 2E, 9, BE, 6A,
1700 DATA 5, 8E, 57, 12, 2E, 2, 13, 8E, D5, 13, 8E, C3, 13, 80, FC, D,
1710 DATA 75, 3D, 8A, 96, F6, 2, 8E, 48, 12, 8E, 8E, 12, 8E, D8, 6, 8C,
1720 DATA 8E, 8E, C0, 80, 3E, 3E, 3, 1, 75, 23, C6, 6, 3E, 3,
1730 DATA 0, 8E, D8, 83, F3, 2, 8A, 97, F6, 2, 3A, 96, F6, 2, 74, 5,
1740 DATA 8E, 84, 9, EB, A, 33, ED, 8E, 7D, 9, 45, 45, 8E, 24, 10, 8E,
1750 DATA 1, 10, 8E, AE, 11, C3, C6, 6, 3D, 3, 0, EB, 5, C6, 6, 3D,
1760 DATA 3, 1, 8E, 9E, 5, 3, 8E, 2B, 0, F7, A6, 8E, 2, 8E, F0,
1770 DATA B, F6, 74, 5A, 56, 53, 8E, 7E, 7, 8E, 9F, 7, 5B, 5E, 8E, 9E,
1780 DATA C5, 2, 8E, 84, 4, BE, E2, 4, 72, 47, 1F, 53, 8E, 9D, 8, 8E,
1790 DATA C7, 22, A0, 78, 1, A2, BE, 2, A1, 37, 3, 5E, F7, E6, 8E, 5,
1800 DATA F, BE, F7, 5, 8E, B4, 11, 83, C7, 10, A1, 39, 3, 33, D2, 8E,
1810 DATA F4, E, BE, EE, 5, 8E, A3, 11, BE, AA, 4, 8E, 9D, 11, 8E, 48,
1820 DATA 12, 8E, 13, 8E, 9, 13, 8E, 95, F, 8E, 36, 11, C3, BE, 6,
1830 DATA 6, 8E, 3B, 8, 1F, C3, 8E, 2B, 12, 8E, 6F, 10, 8E, 4D, 8, BE,
1840 DATA 1F, 6, 8E, 76, 11, 8E, 36, 44, 2, FE, CE, B2, 18, 8E, 21, 12,
1850 DATA 8E, 8, 8E, 114, 8E, D2, 12, 3E, 1, 7E, 59, 80, E4, 5F, 80,
1860 DATA FC, A1, 72, 8E, C0, FC, 5A, 77, E9, 50, BE, 37, 2, FF, 3A, 88,
1870 DATA 24, 8A, CA, 8E, 24, 11, AC, 8E, 11, 10, 8F, 6, 37, 2, 5E, 74,
1880 DATA 8, BE, 3E, 6, 8E, 89, 7, 8E, B3, 80, EC, A1, 8F, B6, F6, 2,
1890 DATA 88, A6, F6, 2, 8E, 90, 8, 58, 73, 9, 8E, 86, F6, 2, 8E, 65,
1900 DATA 11, 8E, 99, C7, 8E, 8B, 2, 0, 0, C7, 8E, B4, 2, 0, 0, 8E,
1910 DATA 91, F, 8E, 74, D, 8E, AB, 10, C3, 48, 69, 67, 68, C0, 69, 67,
1920 DATA 88, 74, 20, 31, 73, 74, 20, 64, 69, 72, 65, 63, 74, 6F, 72, 79,
1930 DATA 20, 68, 74, 20, 68, 74, 20, 68, 74, 20, 68, 74, 20, 68, 74,
1940 DATA 65, 73, 73, 20, 45, 6E, 74, 20, 68, 74, 20, 68, 74, 20,
1950 DATA 67, 68, C0, 69, 67, 68, 74, 20, 32, 6E, 64, 20, 64, 69, 72, 65,
1960 DATA 73, 74, 6F, 72, 79, 20, 61, 6E, 64, 20, 70, 72, 65, 73, 73,
1970 DATA 45, 6E, 74, 65, 72, 0, 8E, 73, 7, BE, 49, 8, 8E, 9C, 10, BF,
1980 DATA 99, 3, 89, 9, 0, 8E, 52, 11, 72, 3C, 80, FC, D, 75, F0, 8E,
1990 DATA 25, 6, 8E, 57, 7, BE, 7A, B, 8E, 80, 10, BF, BB, 1, 8E, 9E,
2000 DATA 8B, 2, 8E, 28, 0, 57, BF, 99, 3, 89, 9, 0, 8E, 2B, 11, 5F,
2010 DATA 12, 11, 80, FC, D, 75, BE, 8E, 96, 8B, 2, 8E, F, 0, 8E, AE,
2020 DATA 1, 8E, AD, 8E, 8E, 6, 8E, 56, E, 8E, F7, F, C3, 1E, 8A, 86,
2030 DATA F6, 2, 4, A1, AA, B0, 3A, AA, B0, 3A, AA, B0, 3A, AA, B0,
2040 DATA 9E, C5, 2, 8E, C7, 5, 33, C9, 83, FE, 1, 76, 7, 56, 8E, 70,
2050 DATA 5, 41, EB, F4, B0, 5C, AA, E3, B, 5E, AC, A, C0, 74, 3, AA,
2060 DATA EB, F2, F0, B0, 20, AA, B0, 0, AA, 4F, 1F, C3, 8E, 8E, 1,
2070 DATA A3, 2E, 2, 8C, 1E, 30, 2, 1E, 6, 8A, 96, F6, 2, 8E, 1, 10,
2080 DATA 8E, 2B, 0, F7, A6, 8E, 2, 8E, F0, 8E, 9E, C5, 2, 8E, 8A, E,
2090 DATA E, 1F, BB, 32, 20, 83, C3, F, B1, 4, D3, EB, 8C, CB, 3, D8,
2100 DATA B4, 4A, CD, 21, 8E, 7D, 10, 8A, 3E, 7A, 1, 8E, 62, 10, FA, 8C,
2110 DATA 16, 2, 8E, 26, 34, 2, FB, A1, 2C, 0, A3, 2C, 2, 8E, D8,
2120 DATA 33, C0, 8E, F0, 40, BF, 86, 7, 8E, F0, 40, BF, 86, 7, 8E,
2130 DATA D6, 8E, 2C, 2, 8E, 0, 4B, CD, 21, FA, 2E, 8E, 26, 34, 2, 2E,
2140 DATA 8E, 16, 32, 2, FB, 7, 1F, BA, 80, 0, B4, 1A, CD, 21, 8E, 0,
2150 DATA 45, B4, 4A, CD, 21, 73, 6, 8A, B4, 3, 8E, 68, FB, 8E, 56, D,
2160 DATA C3, 8E, D3, 4, 73, 3, 8E, 8F, 0, 8C, 8E, 8E, D8, 8E, C0, 83,
2170 DATA 3E, DA, 2, 0, 75, A, 8E, 94, 4, 73, 5, 8E, EE, 3, 8E, 7B,
2180 DATA 8A, 96, F6, 2, 8A, C2, 4, 41, BF, 5C, 1E, AA, B0, 3A, AA, 8B,
2190 DATA F7, 8E, 52, F, C6, 6, 3D, 3, 1, 8E, 8E, 5, 3, 55, 53, 8E,
2200 DATA 8E, 8E, C5, 36, D4, 2, 8E, F, 2, 5B, 50, 72, 4A, E, 1F,
2210 DATA 8E, 2, 3B, 6, 7, 63, 7, 8E, 8E, 72, 6, 8E, CF, 5,
2220 DATA 8E, 36, 8E, 97, F6, 2, 8E, 1F, F, 8E, 82, 1, 72, 2A, 8E,
2230 DATA 5, BE, 4E, 6, 8E, 4, F, C6, 6, 3E, 3, 1, 55, BE, 5C, 1E,
2240 DATA AC, A, C0, 75, FB, 4E, 8E, 8E, C5, 36, D4, 2, 8E, 8E, D, 8E,
2250 DATA 7B, 4, 8E, D6, 8E, 9, 0, 5D, C3, 8E, D6, 8E, F5, E, 72, 5C,
2260 DATA 55, 1E, 8E, C0, 0, 8E, EF, 4D, 8C, 8E, 8E, DA, 5C, 1E, B4,
2270 DATA 39, CD, 21, 72, 45, A, C9, 74, 8, 89, 2, 0, 8E, 1, 43, CD,
2280 DATA 21, BA, 57, 2, B9, 3, 0, B4, 4E, CD, 21, 72, F, EB, 6, B4,
2290 DATA 4F, CD, 21, 72, 7, 8E, 25, 0, 73, F5, EB, 1E, 83, C6, 2B,
2300 DATA 80, C7, 1, C4, 75, 8, 46, 4E, 8E, AE, FF, 7, F, A6, 75, F,
2310 DATA EF, 1E, E, 1F, BA, 51, 2, 8E, 51, 2, 8E, 51, 2, 8E, 51, 2,
2320 DATA 0, 8E, 69, 0, 8E, 0, 3D, CD, 21, 72, 60, 8E, F8, BA, E, 95,
2330 DATA 0, 32, ED, BA, 5C, 1E, B4, 3C, CD, 21, 72, 47, 8E, F0, 8E, 1E,
2340 DATA BF, 2, 33, D2, 8E, BF, 89, FF, FF, B4, 3F, CD, 21, 72, 27, B,
2350 DATA C0, 74, 12, 8E, C8, 8E, D6, B4, 40, CD, 21, 72, 19, 3B, C8, F9,
2360 DATA 75, 14, 41, 74, DF, E, 1F, 8E, DE, 8E, E, 96, 0, 8E, 16, 98,
2370 DATA 0, 8E, 1, 57, CD, 21, 9C, 8E, DE, B4, 3C, CD, 21, 58, 72, 3,
2380 DATA 8E, 80, 9E, 9C, 8E, BF, B4, 3E, CD, 21, 9D, 5E, C3, 56, 8E, F2,
2390 DATA 8E, FD, 5C, 26, 3B, 45, FF, 74, 1, AA, AC, AA, A, C0, 75,
2400 DATA FA, AC, BA, C0, 5E, C3, 8E, 8E, 8E, 2, B, C0, 75, 9, BE, F4,
2410 DATA C3, 8E, 98, 4, F9, EB, 4E, 8E, 7D, 3, 8E, AF, 4, BE, C7, 4,
2420 DATA 8E, D8, D, FF, 36, BC, 2, BF, 99, 3, 89, 9, 0, 8E, 8A, E,
2430 DATA 72, 34, 80, FC, D, 75, F0, 8E, 81, 3, 5B, 89, 1E, D2, 2, 8E,
2440 DATA 2B, 0, F7, A6, B0, 2, 8E, F8, A3, DA, 2, 8E, 86, C5, 2, 8E,
2450 DATA C0, A3, CD, 2, 8A, 87, F6, 2, 8A, A6, F6, 2, 8E, 36, D4, 2,
2460 DATA 8E, 9F, C5, 2, FB, C3, 8E, 52, 3, 83, CA, 2, F9, C3, 1E, D8,
2470 DATA 37, F, 8E, 57, 4, 8E, 36, C1, 6, 8E, 7F, D, 55, 8E, 2E, D2,
2480 DATA 2, 8E, 16, D8, 2, 8E, 27, 0, 5D, BE, B5, 5, 8E, 6C, D, 8E,
2490 DATA 9E, 8E, 2, 8E, 19, 0, BE, 62, 5, 8E, 8E, F, 8E, 8E,
2500 DATA CE, E, 3C, 15, FB, 74, 1, F9, 9C, 8E, F8, D, 90, 1F, C3, 57,
2510 DATA BF, BB, 1, 8E, F7, FC, BF, D7, 5F, BE, BB, 1, 81, FA, D5, 1,
2520 DATA 76, 13, 52, C6, 6, BD, 1, 0, 8E, 30, 2, 8E, 51, 2, 8E, 2A,
2530 DATA D, 5E, 83, 8E, 16, 8E, 23, D, C3, 53, 8E, C7, D, 2E, C7, 6,
2540 DATA 39, 3, 0, 0, 2E, C7, 6, 37, 3, 0, 0, 8A, 96, F6, 2, 8E,
2550 DATA F, D, 8E, A5, B, 72, C, 8E, 93, 2, 8E, E, 0, 9C, 8E, 8E,
2560 DATA D, 9D, 5C, 8B, D6, 8E, A, D, 72, 7D, 1E, 8C, 8E, 8E, D8,
2570 DATA C7, 76, 3B, 3, 2, 0, BA, 57, 2, 89, 3, 0, 80, 3E, 3D, 3,
2580 DATA 75, 3, 8E, 19, 0, BE, 62, 5, 8E, 8E, F, 8E, 8E,
2590 DATA CD, 21, 72, 22, 80, 3E, 9E, 0, 2E, 74, F3, FF, 6, 3B, 3, F6,
2600 DATA 6, 95, 0, 10, 75, 8E, FF, 6, 39, 3, A1, 9A, 0, 8E, 16, 9C,
2610 DATA 0, 8E, 35, 0, 8E, D8, A1, 3B, 3, B9, 20, 0, F7, E1, 8E, 28,
2620 DATA 0, 83, C6, 2B, 80, 3E, 3D, 3, 1, 1F, F8, 75, 1B, 80, 7C, 1,
2630 DATA C4, 75, 8, 46, 4E, 8E, 8C, FF, 72, E, 4E, 4E, 8E, EF, 1E, E,
2640 DATA 1F, BA, 51, 2, 8E, 8C, C, 1F, C3, F7, F3, 7, 74, 1, 40,
2650 DATA 1, 6, 37, 3, C3, B, FF, 75, 9, 80, 7C, 1, C3, 75, 45, E9,
2660 DATA 0, 8E, 49, 29, 38, 40, 29, 75, 3A, BF, 77, 75, 3, 8E, D8,
2670 DATA 0, 56, 72, 16, 2E, 8E, 16, D8, 2, 8E, D1, 1, 8E, 82, 1, SE,
2680 DATA 2E, 8E, 39, 9E, 8E, 2, 75, 1E, 8E, BF, 0, 8E, F7, EB, BE, 1, 2E,
2690 DATA 8E, 96, 8E, 2, 8E, 6A, 1, 2E, 3B, 16, D8, 2, 75, 3, 8E, A7,
2700 DATA 0, 77, F1, 5E, 8E, 70, 1, 73, 3, 8E, 99, 0, 8C, 8E, 8E, D8,
2710 DATA 8E, C0, 8E, 79, FF, 73, 3, 8E, 8D, 0, 8E, CF, 2, 8E, 2, 5,
2720 DATA 8E, F8, B, 8E, 27, 1, 73, 3, 8E, 81, 0, 8E, F2, 3, 72, 3,
2730 DATA 8E, D9, 4, 72, 74, C6, 6, 3E, 3, 1, C4, 3E, D4, 2, 26, 8B,

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3880 DATA 57, 56, 56, 2E, 8B, 36, AA, 2, 8B, D7, 3B, F2, 74, 13, 26, C6, 6A0
3890 DATA 42, 1, C3, 83, C6, 2B, F2, 74, 7, 26, C6, 42, 1, B3, EB, 6BF
3900 DATA F2, 2E, 8B, 36, AA, 2, 5E, 2E, FF, 6, AE, 2, 3, FD, 47, B0, 6C3
3910 DATA CO, AA, B0, C4, AA, 83, C6, 5, B9, 8, 0, EB, 5E, 0, 80, 3C, 799
3920 DATA 20, 74, 9, B0, 2E, AA, B9, 3, 0, EB, 50, 0, 5E, 47, 8B, 44, 58D
3930 DATA 12, AA, 5F, BB, 44, 10, 26, 89, 45, 27, 2E, A1, 3F, 3, 26, 89, 405
3940 DATA 45, 29, C3, C7, 2B, 2E, FF, 36, AA, 2, 2E, 89, 3E, AA, 2, 45, 508
3950 DATA 45, 2E, 8B, 36, AA, 1E, 8A, 7, 32, E4, 3B, C5, 77, 16, 8B, 47, 66A
3960 DATA 3, 3B, 44, 1, 75, 9, 53, 56, 8B, F3, EB, 71, FF, 5E, 5B, 83, 68C
3970 DATA C3, 14, EB, E2, 2E, 8F, 6, AA, 2, 5D, 5E, C3, AC, 3C, 20, 74, 70D
3980 DATA 1, AA, E2, F8, C3, EB, C1, 1, 1E, 55, 8B, 86, B4, 2, B9, 2B, 810
3990 DATA 0, F7, E1, 8B, F0, B8, 2, 0, EB, C6, 3, 8B, 96, B4, 2, 8A, 81F
4000 DATA 3E, BE, 2, 8B, E, 45, 2, 3B, 2E, BC, 2, 8E, 9E, C5, 2, 2E, 526
4010 DATA 8B, AE, B8, 2, 74, 3, BD, FF, FF, 51, 52, 56, 57, B9, 27, 0, 755
4020 DATA 3B, D5, 75, 2D, B, D2, 74, A, AC, 49, EB, AD, 3, 80, FB, C4, 709
4030 DATA 75, F6, 2E, 8A, 3E, 78, 1, AC, A, C0, 74, 7, EB, 9B, 3, E2, 733
4040 DATA F6, BE, 14, 2E, 8A, 3E, BE, 2, 4E, AC, EB, 8D, 3, E2, FA, EB, 8E4
4050 DATA 6, AC, EB, 85, 3, E2, FA, 5F, 2E, 3, 3E, 3C, 2, 5E, 83, C6, 681
4060 DATA 2B, 5A, 42, 59, E2, E3, 5D, 1F, C3, EB, 3D, 1, 8A, 86, F6, 2, 722
4070 DATA 4, 41, A2, 78, 2, B5, 1, 0, EB, 46, 3, 8A, 3E, BE, 2, BE, 591
4080 DATA 70, 2, EB, 76, 3, 8B, B6, 84, 2, EB, 6F, 3, A0, 44, 2, 2C, 606
4090 DATA 5, 32, EA, EB, 2B, 3, 83, C7, 22, 57, 8B, 86, B0, 2, EB, A5, 744
4100 DATA 0, BE, 9, 3, EB, 54, 3, 5F, 3, 3E, 3C, 2, 57, 8B, 86, 1, 450
4110 DATA 3, F7, A6, 5, 3, EB, 8E, 0, BE, 16, 3, EB, 3D, 3, BE, 1E, 5F9
4120 DATA 3, EB, 37, 3, 5F, 3, 3E, 3C, 2, 57, 8B, 86, 1, 3, 2B, 86, 420
4130 DATA FD, 2, 50, F7, A6, 5, 3, EB, 6C, 0, BE, 16, 3, EB, 1B, 3, 625
4140 DATA BE, 29, 3, EB, 15, 3, 5B, EB, 2A, 0, 5F, 3, 3E, 3C, 2, 8B, 48D
4150 DATA BE, 5, 3, F7, A6, FD, 2, EB, 4C, 0, BE, 16, 3, EB, FB, 2, 71A
4160 DATA BE, 30, 3, EB, F5, 2, B8, 64, 0, EB, 86, FD, 2, EB, 4, 0, 68E
4170 DATA BE, D2, FE, C3, 55, BE, 64, 0, F7, E6, 8B, AE, 1, 3, F7, F5, 9F8
4180 DATA D1, E2, 42, 2B, EA, 15, 0, 0, 3D, 64, 0, 75, 8, BE, 24, 3, 522
4190 DATA BE, C8, 2, EB, F, 50, B0, 20, EB, 9F, 2, 5B, EB, 52, 0, B0, 797
4200 DATA 25, EB, 96, 2, 5D, C3, 55, C3, 8B, EA, 8B, F0, 33, C9, BB, A, 81E
4210 DATA 0, EB, C, 80, FD, 3, 75, 7, B0, 2C, 50, 32, ED, FE, C1, 8B, 788
4220 DATA C5, 33, D2, F7, 3, 8B, EB, 8B, C6, F7, F3, 8B, F0, 8B, C2, 4, B2E
4230 DATA 30, 50, 81, C1, 1, 1, B, ED, 75, D9, B, F6, 75, D5, 32, ED, 774
4240 DATA 2B, F9, 2B, F9, 8A, 3E, BE, 2, 5B, EB, 4E, 2, E2, FA, 5B, 5D, 7E4
4250 DATA C3, B2, A, F6, F2, 5, 30, 30, 50, 3C, 30, 75, 2, B0, 20, EB, 687
4260 DATA 38, 2, 5B, 8A, C4, EB, 32, 2, C3, A0, 79, 1, 3B, 2E, BC, 2, 600
4270 DATA 74, 3, A0, 77, 1, A2, EB, 2, C3, 8A, F5, 2, F0, 32, C9, B, 72B
4280 DATA ED, 74, 2, B1, 29, EB, 80, C2, 26, 8A, 3E, BE, 2, B8, 0, 740
4290 DATA 6, 55, CD, 10, 5D, C3, BA, DC, 3, EB, 3C, 2, 33, ED, EB, 86, 7A5
4300 DATA F9, 72, 16, 8A, 86, F6, 2, 45, 45, 3A, 86, F6, 2, 75, 5, EB, 72D
4310 DATA 21, 0, EB, 8, EB, 70, F9, 73, 3, E9, E6, ED, EB, FC, 0, 33, 8AE
4320 DATA ED, EB, 7F, 0, EB, 62, FE, 45, 45, 83, FD, 2, 76, F3, 8B, 2E, 8CA
4330 DATA BC, 2, C3, 1E, 6, BE, 2E, 2, BF, 94, 2, B9, B, 0, F3, A4, 69D
4340 DATA A1, B0, 2, A3, B2, 2, A1, FD, 2, A3, FF, 2, A1, 1, 3, A3, 736
4350 DATA 3, 3, A1, 5, 3, A3, 7, 3, 8E, 6, C7, 2, 8E, 1E, C5, 2, 42C
4360 DATA 33, F6, 33, FF, B9, F8, A7, D1, E9, F3, A5, 13, C9, F3, A4, 7, A7F
4370 DATA 1F, EB, 1, 0, C3, 6, EB, 86, C5, 2, B8, 2B, 0, F7, A6, 8B, 6E4
4380 DATA 2, 8B, F8, 47, 32, C0, B9, 2A, 0, F3, AE, 75, 14, FF, 8E, B8, 810
4390 DATA 2, 8B, 86, B8, 2, 3B, 86, B4, 2, 73, DF, FF, 8E, B4, 2, EB, 7C4
4400 DATA D9, 7, C3, EB, 23, FF, B5, 1, 32, C0, EB, 2C, FF, 8A, 2E, 44, 864
4410 DATA 2, 80, ED, 5, B0, 3, EB, 20, FF, C3, 56, 1E, 8C, C8, 8E, D8, 81F
4420 DATA BA, 4F, 2, EB, 6D, 1, 1F, B, F6, 74, 17, EB, DF, F6, 33, C9, 7C5
4430 DATA 56, 41, EB, 8C, F6, 83, FE, 1, 77, F6, 5A, EB, 55, 1, 72, 6, 800
4440 DATA E2, F8, EB, C3, 5A, E2, FD, F9, 5E, C3, 8A, D0, 80, E2, 5F, B61
4450 DATA 80, EA, 41, 80, 3C, 3A, 75, 10, 80, 7C, 1, 20, 77, A, 4E, 59D
4460 DATA BE, F9, 2, B8, 0, 29, CD, 21, A, C0, C3, 8A, 96, F6, 2, B4, 7E1
4470 DATA E, CD, 21, 8B, 96, F9, 2, EB, 19, 1, C3, 6, B8, 0, 5, CD, 66D
4480 DATA 10, B8, 40, 0, 8E, C0, 26, A1, 4A, 0, A3, 3A, 2, D1, E0, A3, 69A
4490 DATA 3C, 2, 26, A1, 4E, 0, A3, 3E, 2, 26, A1, 63, 0, 5, 6, 0, 36B
4500 DATA B9, 0, B0, 3D, BA, 3, 74, 4, 81, C1, 0, 8, A3, 40, 2, 89, 593
4510 DATA E, 42, 2, BE, 80, 1, 26, A0, 49, 0, 3C, 7, 74, 10, 3C, 2, 3A5
4520 DATA 74, C, BE, 7B, 1, 3C, 3, 74, 5, B8, 3, 0, CD, 10, 32, FF, 53B
4530 DATA B2, 18, B8, 30, 11, CD, 10, 8B, 16, 44, 2, 80, EA, 7, 32, F6, 61D
4540 DATA 89, 16, 45, 2, 7, BF, 76, 1, B9, 5, 0, F3, A4, EB, 1C, 1, 57D
4550 DATA 80, 3E, 85, 1, 1, 74, D, 8A, 1E, 77, 1, 80, E3, 7, 32, FF, 581
4560 DATA B4, B, CD, 10, 33, C0, EB, 46, 0, 47, 47, BE, 9, 1, 8A, 5DB
4570 DATA 76, 1, EB, 66, 0, B0, FE, EB, 40, 0, B0, 20, EB, 30, 4, 46, 6D4
4580 DATA EB, 58, 0, AD, 44, 2, FE, C8, 32, E4, EB, 22, 0, BE, CF, 6, 79F
4590 DATA 57, 8A, 3E, 76, 1, EB, 43, 0, 5F, 3, 3E, 3C, 2, EB, 3B, 0, 4C2
4600 DATA C3, EB, B, 0, B, ED, 74, 6, 3, 3E, 3A, 2, 47, 47, C3, F7, 5WD
4610 DATA 26, 3C, 2, 3, 6, 3E, 2, 8B, F8, C3, 6, 2E, BE, 6, 42, 2, 3FF
4620 DATA 2E, EB, 16, 40, 2, 8A, D8, EC, D0, D8, 72, FB, FA, EC, D0, D8, A0E
4630 DATA 73, FB, 8B, C3, AB, FB, 7, C3, EB, DF, FF, AC, 3C, D, 77, FB, 87C
4640 DATA C3, B4, E, CD, 21, C3, C6, 4, 5C, 46, 52, FE, C2, B4, 47, CD, 85C
4650 DATA 21, 5A, C3, B4, 3B, CD, 21, C3, B4, 9, CD, 21, C3, 1E, E, 1F, 697
4660 DATA 53, EB, 80, 0, 8A, 96, F6, 2, FE, C2, B4, 36, CD, 21, 3D, FF, 8A7
4670 DATA FF, F9, 74, F, 89, 9E, FD, 2, 89, 96, 1, 3, F7, E1, 89, 86, 8AB
4680 DATA 5F, C3, BB, 16, 4, BA, 12, 0, 33, CD, F7, F3, 6BB
4690 DATA 8B, D8, EB, 24, 0, B0, B6, E6, 43, EB, 0, 8B, C3, E6, 42, EB, 94A
4700 DATA 0, 8A, C4, E6, 42, E4, 61, C, 3, EB, 0, E6, 61, EB, 9, 0, 6ED
4710 DATA E4, 61, 24, FC, EB, 0, E6, 61, C3, 1E, B8, 40, 0, 8E, D8, A1, 877
4720 DATA 6C, 0, 8B, 16, 6C, 0, 3B, D0, 74, F8, 1F, C3, 8A, 3E, 76, 1, 611
4730 DATA 33, C9, 8A, 16, 3A, 2, FE, CA, 8A, 36, 44, 2, B8, 0, 6, 55, 5B9
4740 DATA CD, 10, 5D, C3, BA, 0, 2, EB, 8, 8A, 36, 44, 2, FE, C6, 32, 6A8
4750 DATA D2, 53, 32, FF, B4, 2, CD, 10, 5B, C3, EB, B3, 0, 50, 3C, 1, 72F
4760 DATA F9, 74, 3A, 80, FC, D, 74, 35, 8B, D9, 8B, D7, 3, D1, F2, AE, 913
4770 DATA 74, 5, EB, 2A, 0, EB, 25, 2B, D9, 4B, D1, E3, 3, DA, 8B, 86, 78C
4780 DATA B0, 2, 48, 8B, EB, 2, 8B, 86, B4, 2, 8B, FA, 8B, 36, 45, 72F
4790 DATA 2, 3, FE, 4F, 3B, F6, 7, 8B, F8, FF, 17, EB, 58, C3, 1E, 7C7
4800 DATA A, C0, 74, 67, 80, FC, 61, 72, 8, 80, FC, 74, 77, 3, 80, EA, 7D0
4810 DATA 5F, BA, CD, 2B, 0, 8B, 8E, BE, 2, F7, E1, 8B, F0, 8E, 9E, 8FA
4820 DATA C5, 2, 56, EB, 67, F4, 3A, 1C, 5E, 74, 4, 33, F6, 33, C9, 41, 6F2
4830 DATA 2E, 3B, 8E, B0, 2, 73, 34, 83, C6, 2B, 56, EB, 4F, F4, 3A, 1C, 69B
4840 DATA 5E, 75, EC, 1F, 89, 8E, BE, 2, 8B, 86, B4, 2, 8B, 1E, 45, 2, 666
4850 DATA 3B, C8, 72, 7, 3, C3, 48, 3B, C8, 76, C, D1, EB, 2B, CB, 73, 734
4860 DATA 2, 33, C9, 89, 8E, B4, 2, EB, 7B, FA, C3, 1F, EB, D7, FE, C3, 98A
4870 DATA B4, 0, CD, 16, 86, ED, C3, B4, 1, CD, 16, C3, EB, F1, FF, EB, 9DB
4880 DATA F5, FF, 75, F8, C3, B4, E, CD, 10, C3, 0, 0, 0, 0, 0, 686
4890 DATA 756330

```

I received reports from a few people that after a Qformat, a DIR of the disk would report that the data was still there, when actually it was not. This strange 'remembering' no doubt has to do with either DOS buffers or disk cache software.

I found that issuing an INT 21, function 0Dh (Disk Reset) instruction just before and after an INT 25h or 26h effectively jogged DOS's memory. Although the description of function 0Dh, 'Write file buffers that have been modified to the disk' does not exactly fit the 'remembering' problem, it does the trick. I would strongly suggest you adopt this approach if you have reason to use interrupts 25h or 26h. If you have experienced this 'remembering' problem with Qformat, you can get an updated BATCHMAN from ^APC MAGNET.

Since PRUNE also uses sector I/O interrupts 25h and 26h, I've incorporated what I learned about these interrupts in Qformat by issuing the Disk Reset calls before and after each sector read or write.

Dot and dot-dot

One other interesting aspect of the PRUNE program involves dealing with the . and .. directories (dot and dot-dot). These directory entries are DOS's way of keeping track of a disk drive's directory-tree linkages. Dot and dot-dot actually occupy space on-disk just like any other directory record entry, and

they are always the first two entries in a directory. The exception is the root directory, which does not have dot and dot-dot entries.

The dot directory entry is a pointer to the owner of the directory, that is, to itself. The dot-dot entry is a pointer to the directory's parent. You can use dot and dot-dot with DOS commands such as CHDIR just as you can use any other directory name. For example, you can change to the current directory's parent by entering

```
CD ..
```

CD, of course, is the abbreviation for CHDIR. Although I don't have room here to go into specific examples, changing to the parent directory can be a very useful command. It's also legal to enter

```
CD .
```

This will 'change' to the current directory, which does nothing and is useless, but you won't get a DOS error message for doing so.

The double-dot

The real interest in the dot-dot directory entries comes from the way PRUNE manipulates them to move a directory, its files and subdirectories to another parent without actually physically moving any of

them on the disk. This results in very fast moves! Note, however, that the technique I'll describe here will work only for moves within the same logical disk partition. Moving directories and files from one disk to another requires physically moving the data.

You'll find it useful to follow along in the Directory Move diagram shown in Fig 2 as I describe the changes made to the dot-dot entry to move the directory UTIL from the root directory to the APC directory. The cluster number to the right of the name of each directory is an index to the location of that directory on-disk. Cluster numbers are converted to actual sector numbers when the disk data is accessed.

The contents of each directory cluster are in the form of directory entry records. Each directory record contains 32 bytes, which provide fields for the name, extension, attribute, creation time and date, starting cluster number and file size in bytes. PRUNE cares only about the name, attribute and starting cluster fields, so to keep things simple, only these fields are shown in the diagram. Note that the 10h in the attribute field indicates that the entry is a directory; a zero is used to indicate a file.

In the Before section of the diagram, the UTIL directory entry is in the root directory cluster. As shown in the UTIL directory starting cluster field, the third cluster is where the UTIL directory is

PRUNE

command

Purpose: To organise a hard disk by renaming, removing, copying and moving entire directories together with their files and subdirectories. Directories may be put into other locations on their current or on another drive's directory tree. PRUNE also reports directory or branch size and permits directly calling up APC's DR and DIRMATCH utilities to inspect files or update directories with current file versions.

Format: PRUNE [*d:*] [*d:*]

Remarks: Entered at the DOS prompt without either of its two optional (*d:*) drive arguments, PRUNE displays a graphic directory tree of the current drive in both of its side-by-side windows. The *d:* arguments permit initial display of any one or two directory trees on the system. The active window, which has the highlight bar, can be toggled with the Tab key or with the Left or Right Arrow keys. The directory tree can be traversed with the Up Arrow, Down Arrow, PgUp, PgDn, Home and End keys. Esc exits the utility.

The operations PRUNE can perform on the highlighted directory are executed with the Function Keys. Note that except for the Rename Directory command (F3), the word 'directory' here includes all directory and subdirectory files. Prompts and confirmatory warnings are provided as needed.

F1 copies the highlighted directory to another location on the current tree or to one highlighted in the alternate window. F2 removes a directory and should be used with special care. F4 moves a directory (it copies, then removes the original). F5 gives the size of a directory branch, including subdirectories, in terms of the bytes allocated to the clusters required. Although PRUNE will not copy or move directories where insufficient space exists, this information may be useful in deciding which directories to work on. F6 displays the same information for a directory's files without including subdirectory files. F7 permits loading and displaying the tree of a new drive. F8 calls up the DR utility to permit reading the files in a directory, and F9 calls up DIRMATCH to permit updating a target directory with file versions from a more recent directory. Note that for F8 and F9 to work, these utilities must be on the DOS path. If a floppy disk drive is used, COMMAND.COM must also be on it.

Instructions on modifying PRUNE.COM to call a utility other than DR or to change its colour scheme are given in the text box 'Customising PRUNE'.

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THE DIRECTORY MOVE COMMAND

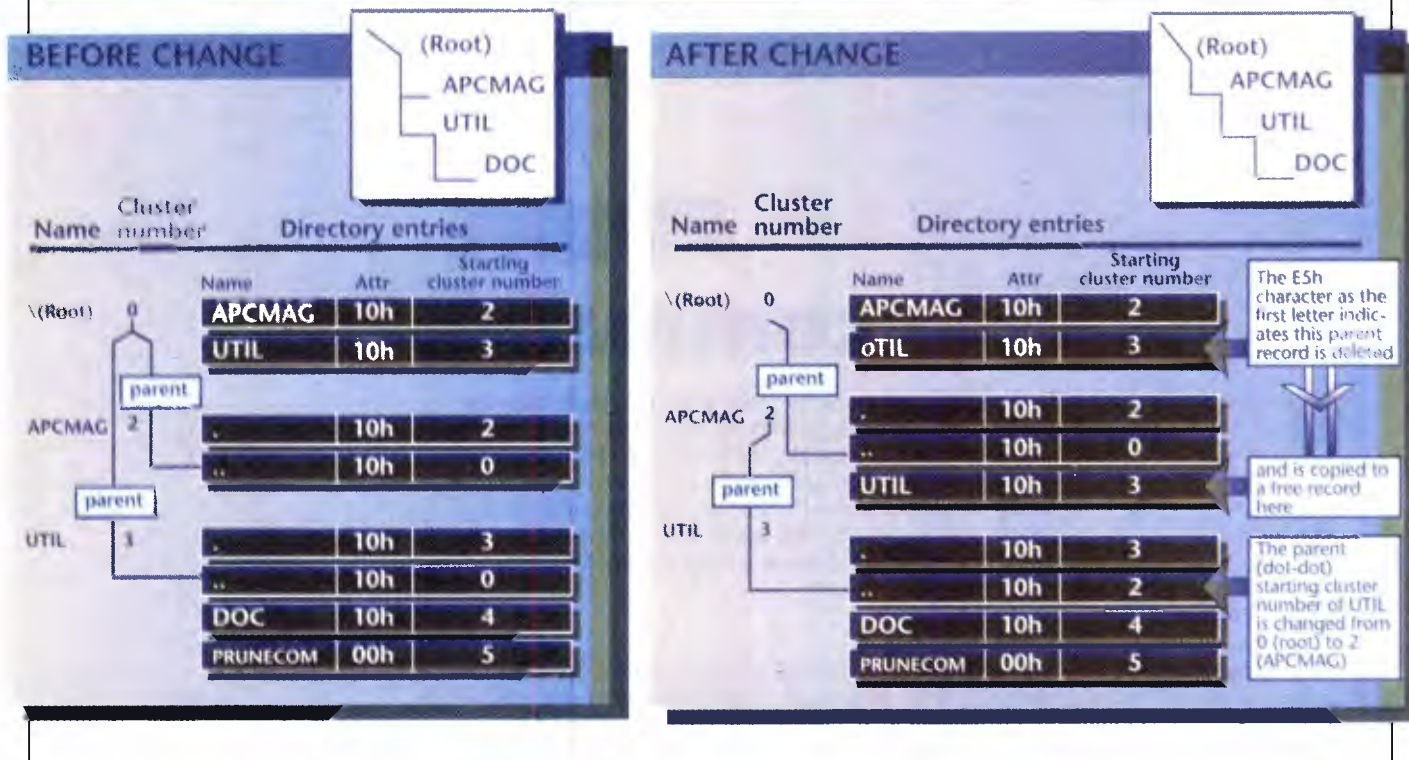


Fig 2 When moving directories and their files within the same disk partition, PRUNE manipulates the 'double-dot' directory entries rather than physically copying the data. As a result, you can move hundreds of files in the blink of an eye

stored. If you look at the UTIL directory, you'll see that the first entry is dot with a 3 in its starting cluster field. The 3rd cluster is the UTIL directory; the dot entry, therefore, points to itself, the owner of the directory. The dot-dot starting cluster number, 0, points to the parent directory, the root directory.

To move the UTIL directory from the root directory to the APC directory, three things must occur. The first is that the

UTIL directory entry must be physically moved from the root cluster to an empty cluster in the APC directory cluster. The second step is to delete the UTIL entry in the root. This is done by changing the first letter of UTIL to ESh, DOS's delete code. The ESh is what you are asked to change back to U when using file-recovery software like The Norton Utilities.

The last step involves the dot-dot entry

of the UTIL directory. To reflect the disowning of UTIL by the root and the adoption of UTIL by APC, the starting cluster number of the dot-dot parent pointer must be changed from 0, the root, to 2, APC. Once these three changes are written to disk, the UTIL directory and its subdirectory DOC and the file PRUNE.COM will all belong to APC.

It's tricky

Of course, implementing all this isn't quite as easy as it sounds. It involves things such as reading the disk boot sector, which has information needed to figure out the locations of the root directory, the FAT, and the first data cluster on-disk. Reading the sectors and writing them back are done with DOS interrupts 25h and 26h, respectively; this must be done with extreme care so as not to corrupt the disk. Note also that the INT 25h and 26h instructions have two different formats, depending on whether or not the disk partition is greater than 32M.

While I don't have space here to go into all its programming details, I do want to mention one precaution PRUNE has to take in the moving process. As I just indicated, the only physical move PRUNE has to make is to shift the directory entry to the new parent's directory. To do this

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requires that there be a free record to receive it. A free record will have as its first character the E5h delete character or a zero (which indicates that it has never been used).

Like files, directories are allocated space on-disk one cluster at a time. On a typical hard disk, a cluster has 2K or 2048 bytes. (Older 10M hard disks use 8K clusters.) Directory entries are 32 bytes in size, which means that a one-cluster directory has room for 64 entries. If a directory's dot, dot-dot, and file entries add up to 64, the directory cluster will be full, and there will be no empty place for the moved record.

To avoid this situation, PRUNE creates a temporary subdirectory, with the name \$\$\$\$\$\$, in the destination directory. This temporary subdirectory is then immediately removed with standard DOS interrupt 21 calls. If the directory was full, DOS will allocate another cluster to the directory to hold the \$\$\$\$\$\$ entry. Since the temporary directory is immediately deleted, PRUNE will always be able to find a deleted record (the \$\$\$\$\$\$ entry) whose first character is E5h. The deleted record will be all by itself in a newly allocated cluster chained to the previous one.

But if you create a subdirectory that results in allocating a new cluster, won't deleting that subdirectory return that cluster back to the disk pool? After all, that specific cluster will be empty and completely unused. In a sense, directories are just files, and if reducing a file in size frees clusters, those clusters are returned to the disk pool.

In another sense, however, directories are not just files. Once a cluster is allocated to a directory, it is never deallocated as long as the owner of the directory exists. Probably the reason DOS does not deallocate freed directory clusters is that directory entries are not necessarily contiguous, like a file's data. When a directory entry is deleted, the freed space is not consolidated by moving the other records down; the deleted record remains where it is, with only the E5h character to indicate that it is not in use.

Why doesn't DOS consolidate the records? Suppose a directory is large enough that three clusters are allocated to it. Now suppose you delete half the entries that occupy the middle cluster and half the entries in the last cluster. A cluster could be freed if the active entries in the third were moved into the erased slots of the second and the third cluster were then unlinked. However, this consolidation process would slow response time and the gain in the few extra reclaimed clusters would not be worth it.

What this all means is that if you have

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a directory with a lot of files, deleting those files will free the clusters used by the files themselves, but not the clusters used by the directory. The only way to do that is to RD the directory and then re-create it.

In closing

PRUNE's own functionality, coupled with its integration of DR and DIRMATCH, gives you all the power you need to keep your directory system up to date. And now you won't have any excuse to keep putting off the organisational task you know is long overdue.

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QEDPAN SmartEditor(.*) for PAN Program ANimator V1.00 900608

QEDPAN	HTX	A demonstration file.
		Requires HyText.EXE ex PC-SIG1234.
GO	BAT	Run demonstration.
README		This File.
README	GES	Readme file with Gestetner LCL codes.
QEDPAN	EXE	Editor for PAN (Program ANimator).PAN files.
SAMPLE	PAN	Sample script file.
VOCAB	PAN	Sample vocabulary.

QEDPAN is a simple screen editor that knows something about the special keywords and syntax of Program **ANimator** (**PAN**) scrip files. Keywords, punctuation and parameters are highlighted in different colors and syntax errors where detected are highlighted in **red**.

PAN is an interesting DOS utility which assists the user to run yet another program ... and was described in the May 1990 issue of Australian Personal Computer Magazine on p193 in the Productivity section. The documentation for **PAN** concedes that the program does little error checking when it reads its script files.

QEDPAN doesn't presume to know all the syntax either, but the gaps in the knowledge of the two programs overlap, providing more complete coverage than for either program in isolation. A user is therefore better off using both programs together.

Some very trivial errors upset the first version of **PAN**. For Example trailing spaces after a 'jump label' command causes a 'PAN Error: label not found' message. It seems that **PAN** regards 'label' and 'label ' as different. **PAN** doesn't detect this problem very well, nor does it say where the problem occurs. Such errors are best prevented at Edit-Time rather than at Compile-Time. **QEDPAN** shows where these trailing spaces are located to help you track them down, saving the user a lot of Debug-Time.

A useful improvement to **PAN** , would be to report the line and column number where it thinks the (first) error might be located. Using the /RC command line option, the user would then be able to run this SmartEditor(.*) with the cursor located at that row and column.

Command Line Options:

QEDPAN sample	assume .PAN as default filename extension.
QEDPAN sample.	override default filename extension.
QEDPAN /w sample	runs in write-protect read-only view mode.
QEDPAN sample /rc 345 12	Position cursor at row 345 Col 12.
QEDPAN /?	Help.

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QEDPAN is based on the Turbo Pascal v3 screen editor QED.PAS from PC-BLUE0261 (now converted to TP5) , and is similar to other SmartEditors(.*) in the **QEDSME**(.*) series.

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Reverting to the default directory

I often use Lotus 1-2-3's /File Directory command to change the default directory temporarily. But many times I need to return to the original default directory later in the 1-2-3 session. Unfortunately, 1-2-3 does not have a /File Directory Reset command. So to revert to the original default directory, you must issue the /File Directory command and type the name of the original default directory.

But I found a way to simplify this process. I discovered that 1-2-3 reserves the 49th to 116th bytes in the 123.CNF file for the specification of the original default directory. The last character of the name of the directory is followed by an ASCII 0. For example, in a 123.CNF file that specifies C:\123\WORKSHEETS as the startup directory, the 49th to 65th bytes are

```
C : \ 1 2 3 \ W O R K S H E E T S
```

The 66th byte is an ASCII 0.

After determining where the name of the default directory is stored, I developed a macro that extracts that name, issues the /File Directory command and specifies that name as the new default directory. This macro is shown in Fig 1.

The first statement in this macro instructs 1-2-3 to open 123.CNF, which is stored in the C:\123 directory. (If your

123.CNF file is stored in a different directory, modify this statement accordingly.) If the file exists, 1-2-3 opens it and proceeds to the statements in cells B2..B6. If the file does not exist, 1-2-3 beeps and cancels the execution of the macro.

The second statement moves the file pointer to the 49th byte in the 123.CNF file — the first byte of the name of the start-up directory. At that point, 1-2-3 executes the statement in cell B3, which commands it to read the current byte, as well as the 66 bytes that follow it, into the cell named DIRECTORY (B8). Note that when 1-2-3 imports ASCII 0 into the DIRECTORY, the character is converted into Lotus International Character Set (LICS) character 153.

The fourth statement sets up a loop that determines the offset of the first LICS 153 in the label in DIRECTORY relative to the beginning of that label. (This character marks the end of the name of the default directory). During each pass through the loop, the statement in cell B12 examines a different character in the string starting with the first character. If the character is not an LICS 153, 1-2-3 increases the value of COUNT (B10) by 1 and begins another pass. When 1-2-3 finds the first LICS 153, it breaks out of the loop. At this point, the value of COUNT is the number of characters in the directory name. Consequently, the statement in cell B5 reduces the label in DIRECTORY to the name of the default directory.

Finally, 1-2-3 executes the statement in cell B6, which commands it to issue the /File Directory command, type the characters stored in DIRECTORY (at this point, the name of the original default directory) and press Enter. This makes the original default directory the default directory once again. Since cell B7 is blank, 1-2-3 closes the open file and ends the macro.

M Sullivan

Mr Sullivan's clever macro works as described, and it is useful in situations where you've used the /Worksheet Global Default Directory command — instead of the /File Directory command — to change the default directory. Note, however, that if you issued the /Worksheet Global Default Update command after using the /Worksheet Global Default Directory command to change the default directory, 1-2-3 will have written the name of the new default directory to the 123.CNF file. Consequently, 1-2-3 will make that directory — not the original default directory — the current directory.

In some cases, there is an easier way to return to the original default directory. If you used the /File Directory command (rather than /Worksheet Global Default Directory) to change the default directory, you can revert to the default simply by issuing the /Worksheet Global Default Directory command and pressing Enter.

This simpler method works here because the /File Directory command doesn't change the default directory; it overrides it. Consequently, when you issue the /Worksheet Global Default Directory command after using the /File Directory command, 1-2-3 will list the name of the original default directory — not the one you specified when you issued the /File Directory command. Pressing Enter re-specifies the original default directory, cancelling the effect of the /File Directory command — CS.

DEFAULT DIRECTORY MACRO

COMPLETE LISTING

	A	B	C	D	E	F	G
1	\d	{open "c:\123\123.cnf", "R"} {Beep} {Quit}					
2		{SetPos 48}					
3		{Read 67, DIRECTORY}					
4		{For COUNT, 0, 66, 1, LOOP}					
5		{Let DIRECTORY, @LEFT(DIRECTORY, COUNT)}					
6		/fd{DIRECTORY}					
7							
8		DIRECTORY					
9							
10		COUNT					
11							
12	LOOP	{If @CODE(@MID(DIRECTORY, COUNT, 1))=153} {ForBreak}					
13							

Fig 1 This macro manipulates the 123.CNF file, so that you can quickly return to your original default directory once you have changed it temporarily

'Unapply' names in Excel

Microsoft Excel doesn't automatically replace cell co-ordinates with their range names. You have to replace each occurrence using the Apply Names com-

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TJ'S WORKSHOP

APPLY 2 NAMES TO ONE CELL

	A	B	C
1	January	February	March
2	Sales 12345	12789	14123
3	COGS 9012	8901	9012
4	Profit 3333	3888	5111

Fig 2 This sample data is used to illustrate the Excel option to apply two names to one cell. For example, you can name cell A2 'January Sales', cell B2 'February Sales' and so on

mand. For example, if the range A1:A10 is named VALUES and cell A12 contains the function =SUM(A1:A10), you must issue the Apply Names command, select the name VALUES and click OK. Then the formula in A12 would read =SUM(VALUES).

Unfortunately, if you subsequently delete the range name VALUES, the formula does not automatically revert to SUM(A1:10); instead Excel returns the error value #NAME?. And worse yet, there isn't even an 'Unapply Names' command that would replace all occurrences of the range name you want to delete with co-ordinates of the range.

The solution is to use Replace. (To unapply the name from every formula in the worksheet, select only a single cell.) First pull down the Formula menu. Then choose Replace, type the range name into the 'Replace:' text box, type the co-ordinates of the range name into the 'With:' text box, make sure the Part option is selected and use the Find Next and Replace buttons to replace all occurrences of the range name.

Once Excel has reinstated the cell references, you can then safely delete the range name.

J Martin

It's frustrating that Excel doesn't automatically apply defined range names to formulas the way most other spreadsheet programs do. It's even more frustrating that it doesn't automatically 'unapply' the names when the definitions are deleted. But in the first case, there appears to be a reason for the unaccommodating behaviour.

Excel's Apply Names command has an option that lets you apply two names to a given cell — one derived from the text at the top of the cell's column, the other from the text at the left side of the column's row. For example, if the cell is in a column headed January and a row headed Profit, Excel's Apply Names command can automatically name the cell 'January Profit'.

To see how this is done, take a look at the mini-worksheet in Fig 2. The first thing you would do after setting up this matrix is select the whole thing — A1:D4. Then pull down Excel's Formula menu,

choose Create Names, check the Top Row and Left Column checkboxes and click OK. This command causes Excel to create the following names:

Name	Refers to
Sales	\$B\$2 : \$D\$2
COGS	\$B\$3 : \$D\$3
Profit	\$B\$4 : \$D\$4
January	\$B\$2 : \$B\$4
February	\$C\$2 : \$C\$4
March	\$D\$2 : \$D\$4

Now comes the good part. With the range still selected, pull down the Formula menu and choose Apply Names. In the dialogue box, select all size names — Sales, COGS, Profit, January, February and March. (To select more than one name at a time, hold down the Ctrl key while you click each name in turn.) Still in the Apply Names dialogue box, make sure that the check boxes next to Ignore Relative/Absolute and Use Row and Column Names are checked.

Now click the Options>> button. Excel responds by adding some more check boxes and radio buttons at the bottom of the dialogue box. Remove the checks from the boxes next to Omit Column Name If Same Column and Omit Row Name If Same Row. In the Name Order radio-button group, click Column Row. Now click the OK button.

At this point, your Profit formulas in B4:D4 have nice descriptive names. B4 reads January Sales-January COGS, C4 says February Sales-February COGS and so on.

It's because Excel gives you the option to apply intersecting names based on row and column headings that it doesn't automatically apply names the way Lotus 1-2-3 and other programs do. On the other hand, there's no apparent reason why Excel doesn't 'unapply' the names if you delete their definitions — CS.

Problems with /Data Table

I recently encountered a situation in which Lotus 1-2-3's /Data Table command did not return the correct results. In calculating the monthly payment for a \$100,000, 12 per cent Annual Percentage Rate (APR), 30-year loan, I entered

the values 100000, .12 and 30 into cells B1, B2 and B3, then entered the function

@PMT (B1, B2/12, B3*12)

After making these entries, I realised that I also needed to calculate the payment at 10, 11, 13 and 14 per cent APRs. To do this, I entered the formulas

A6: +B2-.02
A7: +B2-.01
A8: +B2+.01
A9: +B2+.02

into cells A6..A9. Then, I issued the /Data Table 1 command, and identified cells A5..B9 as the Table range and cell B2 as the input cell. Fig 3 shows the results.

Unfortunately, only the value in cell B6 is correct. Cell B7 should contain 952.32 instead of 804.62, cell B8 should contain 1106.20 instead of 877.57 and cell B9 should contain 1184.87 instead of 1028.61.

J Harris

The formulas in cells A7..A9 of Mr Harris' worksheet cause the /Data Table command to fail. In most cases, the leftmost column of a one-way data table (and both the leftmost column and topmost row of a two-way data table) will contain values although they may contain formulas. However, if the formulas reference the input cell(s), either directly or indirectly, the /Data Table command returns incorrect results.

When 1-2-3 executes the /Data Table command in Mr Harris' example, it substitutes the results of the formulas in cells A6..A9 into cell B2 one at a time. After each substitution, 1-2-3 recalculates the entire worksheet and places the result of the function in cell B5 into the appropriate cell of the second column of the table. Since the formulas in cells

A6..A9 reference the input cell (B2), their results change after each substitution. Thus, 1-2-3 substitutes the updated — rather than the original — results of these formulas into the input cell. And consequently, the results that 1-2-3 enters into the right-hand column of the table are not based on the original values of the formulas in the left-hand column of the table. For example, the values substituted from formula in A7 is the result not of +B2-.01 but rather of (+B2-.02)-.01. So for the purpose of the input cell the formulas in A6..A9 become effectively

A6: +B2-.02

A7: (+B2-.02) -.01
A8: ((+B2-.02) -.01) +.01
A9: (((+B2-.02) -.01) +.01) +.02

And the Payment table is based on 10, 9, 10 and 12 per cents rather than the expected 10, 11, 13 and 14 per cents.

In order to avoid this problem, you should not use formulas that reference the input cell as entries in the leftmost column of a one-way data table, or in either the leftmost column or top row of a two-way data table. If you want to substitute the results of formulas into the input cell, you should use the /Range Values command to replace those formulas with their cur-



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SAMPLE DATA ON PAYMENTS

	A	B	C
1	Principal:	\$100,000	
2	Rate:	12.00%	
3	Term:	30	
4			
5	Payment:	\$1,028.61	
6	10.00%	\$877.57	
7	11.00%	\$884.62	
8	13.00%	\$877.57	
9	14.00%	\$1,028.61	
10			

Fig 3 This sample worksheet shows the monthly payments on a 30-year, \$100,000 loan when different APR's are used. The results of the rates in A6..A9 are incorrect, because the rates are formulas rather than values

rent values prior to executing the /Data Table command.

This same problem occurs in many other spreadsheet programs, including Symphony and Excel — CS.

Desktop reconstruction wrinkles

Rebuilding the Macintosh desktop from time to time can save some hard-disk space, but it causes the comments in the Get Info boxes to be erased. Here's a way around this problem for anyone who's comfortable with ResEdit or some other resource editor:

1. Start Apple File Exchange or any other program that lets you see and copy invisible files.
2. Make a copy of the file called Desktop, giving it a different name if the application you're using allows you to. If it doesn't, save the copy to a different folder so that you won't overwrite the original Desktop file. With Apple File Exchange, choose Rename Destination Files from the File menu to change the name.
3. Rebuild the desktop by holding down the Option and Command keys

while your Mac is starting. Just before your hard disk is mounted, you'll get a confirmation dialogue box asking whether you want to rebuild the desktop. Click on OK.

4. Once the desktop has been rebuilt, open ResEdit and open the copy of the Desktop file that you made in Step 2. Find the FCMT resource in the list of resources. This resource contains the Get Info information that was erased when the desktop was rebuilt. Select and copy it.

5. While still in ResEdit, open the rebuilt Desktop file and paste the FCMT resource into it. Now select the copy you made of the Desktop file and choose Clear from the Edit menu.

6. Quit ResEdit and answer Yes to "Save 'Desktop' before closing?". Your Get Info boxes will now have their comments restored.

G Lentz

Enhancing WordPerfect

Occasionally, a reader submission comes along that contains not one, but a whole multitude of solid productivity tips. One such submission recently arrived from Herbert Kay, whose

numerous suggestions might collectively be titled, 'Tips you won't find in your WordPerfect manual'.

Macros unlimited

Invoking macros by name, using Alt-F10, is a tedious business at best, as the overwhelming popularity of Alt and Ctrl-key macros attests. A problem arises, however, because the number of desirable functions — some user-specific, others general — that can't be executed directly from WordPerfect's menus exceeds the number of available single-key Alt and Ctrl-key macros. Mr Kay notes, however, there is an easy way to expand almost indefinitely the number of macros you can put inside a single keyboard-definition file (.WPK). He writes:

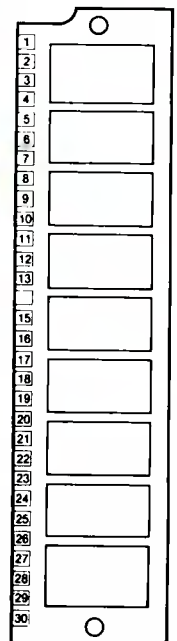
"Tucked away in your MACROS.WPK file is an innocuously titled macro identified as Ctrl-G: 'Glossary Macro Expand Abbreviation'. Its official purpose is to expand an often-used abbreviation into its full form (for example, fyi to for your information), and several samples are supplied. What the manual doesn't tell you, however, is that the same expansion facility can be used to invoke vir-



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IAC AT/20	80286-16	16/21	1M/4M	20M (65ms)	1.2M	1/1/1	8/5	\$1595	\$1745	\$2195	\$2295
IAC AT/40	80286-16	16/21	1M/4M	40M (28ms)	1.2M	1/1/1	8/5	\$1645	\$1795	\$2395	\$2495
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tually any kind of macro you choose to create using text and/or formatting codes. The only price you pay is striking just one more key (usually) than you would for a conventional keyboard macro.

"Thus, for example, you might use

c Ctrl-G

to invoke a 'closing' macro for your personal letters (Tab Tab Tab Tab Sincerely Yours, Enter . . .). When you run out of single alphabetical letters, you can expand letter pairs — aa or ab and so on, or numbers. I have found this much more efficient than creating conventional macros that must be invoked by Alt-

F10 plus a name or number, and that soon start to clutter your directory with a multitude of .WPM listings."

The principle behind such a series of macros has much in common with the command-oriented approach taken by the program Companion. A single macro-activation key — in this case Ctrl-G — is used with a one or two-letter mnemonic. Note that the mnemonic is typed before you hit Ctrl-G; using the conventional WordPerfect technique, you'd hit Alt-F10 first and then type in whatever name or number you had given your macro.

In order to use Mr Kay's approach directly, however, you would have to select MACRO.WPK as your active key-

board, for this is the .WPK (keyboard) file that contains the master Ctrl-G. That may present a problem. Users of version 5.0 have three WordPerfect-supplied sets of keyboard macros, and if you've updated to version 5.1, you have several more. Chances are that you'll want to use some of the macros from each: perhaps the F1/F3 switch between Cancel and Help, from ALTERNAT.WPK; the Home-key assignment (to perform Home, Home, Home, Left Arrow) from the ENHANCED.WPK; the Ctrl-G and many more of the assignments contained in MACRO.WPK; and a number of the handy SHORTCUT.WPK keyboard macros — CS.

Customised keyboard

It's obviously impractical to go back and forth selecting different keyboards while you're working. The answer is to create your own .WPK file that will incorporate the group of WordPerfect-written macros that meet your needs, assigned to the keys that best suit you. Addressing users of version 5.0, Mr Kay writes:

"The WordPerfect manual describes one way to excerpt individual macros from the MACROS and ENHANCED keyboard files into macro files. If you follow the recommended procedure, however, each transposed macro becomes a separate file. Thus, if YOURFILE.WPK contains 20 transferred macros, there will be 20 .WPM files (for example, ALTA.WPM, ALTB.WPM) cluttering your disk. Fortunately, there is a better way, courtesy of Karen Acerson of WordPerfect Corporation.

- At the main editing screen, type Shift-F1, 6, 4 (to Create), and at the prompt for the name of the keyboard, type in the name you want for your own new combined macro file. Here, let's call it YOURFILE. Then press Enter. Facing you should be the blank menu for YOURFILE.WPK, the target file.
- Hit F7. You should now see the names of all of the available keyboard-macro files, including YOURFILE.
- Move the cursor to the keyboard that will be your source file — the one from which you will pull out specific macros, and press 1 to Select it.
- Now move the cursor to highlight the target file, that is, YOURFILE, and then type 5 for Edit. (Do not Select it.)
- From the menu that appears, type 4 to Create and give it a key, for example, Alt-A. (My personal preference, to minimise later confusion, is to use the same key mapping in YOURFILE as in the source file. This may not always be possible, but I'll assume you can do so here.)

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TJ'S WORKSHOP

- Press 1 and then enter a short verbal description of the macro. Then type F7.
- Press 2 (for Action) and then delete whatever shows up in the Action box. Then type Ctrl-V once. The screen will show no change with this keystroke.
- Still in the Action box, hit the key from the source keyboard that identifies the macro you want to transpose, for example, Alt-A (if you are using the same key name as on the original). The contents of the Alt-A on the source keyboard will suddenly appear in the Action box of YOURFILE.WPK.
- Hit F7 twice. You now should be in the YOURFILE menu, with Alt-A listed as the first macro in that file.
- Repeat the steps above to transpose the next macro. If you want to create your own macro and add it to YOURFILE, from the main editing screen type Shift-F1, 6 and Select YOURFILE (if it's not already selected as your macro keyboard). Then type 5 to Edit, then 4 to Create and assign an unused key. Enter a description, go into the Action box and, after deleting anything there, enter the keystrokes and codes of your macro."

In WordPerfect 5.0 Mr Kay's procedure works perfectly, but in version 5.1, as I discovered, you can't make the transposition from the source to the target file in a single, smooth step. WP 5.1 users should start by creating a blank YOURFILE (it's Shift-F1, 5, 4 in version 5.1) as above. Then:

- Highlight the keyboard source file (you don't have to Select it) and hit 7 to Edit it.
- Move the highlight to the macro you want to copy and pick Option 6 (Save/Macro). You'll be prompted for a name or Alt-key. Supply anything — Alt-A or Smith — to christen the macro file that will now (temporarily) contain the selected macro you want to use in YOURFILE.
- Press F7 to return to the list of keyboard files and move the highlight to YOURFILE (again, don't Select it by pressing 1). Hit 7 to Edit it.
- At the next screen, pick Option 7 (Retrieve). You'll first be prompted for the YOURFILE key onto which you wish to retrieve the macro, and when you've typed that in, you'll be prompted for the name you gave to the saved file from the source keyboard. Supply that, and you'll suddenly see that it is now ensconced in YOURFILE.WPK. After you've backed out of your keyboard construction task, you can delete the temporary file(s) you created — CS.

Saving space

One major advantage of building your macros into a keyboard file (.WPK) is

that it saves hard disk storage space. Keyboard macros are often less than 100 bytes in length, but each one stored as a separate file requires a full cluster — typically 2048 types — on your disk. You may easily end up with 20 to 40 keyboard macros before you've got WordPerfect working to your liking, and that adds up to the kind of waste that only a government department would tolerate.

As a further contribution to saving space in ways your manual didn't tell you, Mr Kay adds the following:

"As you've probably discovered, WordPerfect files, especially those containing styles, can consume a great deal of space. One way to markedly reduce the length of your saved files is to dispense with open styles and use macros instead.

"WordPerfect has never clarified the functional difference between styles and macros. Both can incorporate text and codes. With the exception of being faster to edit repetitions of a given style than those of a macro, I have yet to find a macro that can't do anything an open style can do, and do it in a small fraction of the space. For example, I've had 10K documents incorporating a style shrink to only 2K when those documents were created afresh with a macro. (If you merely try to delete the style and substitute a macro in the same document, you probably won't see much of a saving.)

"When you use a style to format a document, it appears that WordPerfect packs in your entire style-library file — not just the individual style you used — when you save the file to disk. Obviously, using a macro instead will save a lot. Unfortunately, however, paired styles can have unique advantages that cannot be duplicated by macros.

"Even avoiding open styles can still leave you with long files, however. There are at least three additional file-shrinking techniques I'd like to suggest, though their efficacy can't be guaranteed: sometimes they work, sometimes they don't, and it's hard to predict when or why. (Once in a while they may actually increase, not decrease, the length of a file.)

"Two variables that affect the success of a given file-shrinking method are the nature of the document and the subversion of 5.0 you're using. (I find that the following methods work better with the April 1989 release than with the October 1988 release.) In any case, you have nothing to lose except a few moments trying them. It's advisable to experiment with them in advance to see which one tends to work

best with your release date of the program and with the kinds of documents you create. All three depend on the fact that saved files often carry along invisible packets of unnecessary information that take up space at the head of the document, but sometimes can be safely deleted.

- After saving a file, immediately retrieve it into a blank screen and resave it. (Set WP to make backups — Shift-F1,

1, 2, yes — to see the difference more easily.) I once created a title page containing just a formatting style and only 33 words of copy. The resulting file occupied 22,769 bytes of disk space. A resave shrank the file for me to less than 12,000 bytes — a 48 per cent saving. Yet other files sometimes have yielded little or no saving with this method.

- WordPerfect's technical representatives suggest a variant on the above. After saving the file, start with a



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TJ'S WORKSHOP

fresh, blank screen and use the Spacebar to move the cursor one column to the right. Then go into List Files to retrieve the file. (Answer yes to the prompt 'Retrieve into current document?') Once the document appears on the editing screen, Backspace once to delete the 'empty' space at the head of the document where invisible packets may have been lurking. Then save the file again.

● Finally, investigate a shareware product called WPTOOLS, which is widely available on bulletin boards and contains a program called FIXPRE. I have found that it can not only strip off useless baggage from your all-important .SET file (and, according to its programmer, thereby sometimes cure mysterious formatting misfires), but it sometimes can reduce the length of ordinary data files, as well."

This problem with excessive-length files is one that will continue to plague Word-Perfect users until we all get read-write optical disks. I can't add to Mr Kay's suggestions on this point and must caution that sometimes the information contained in the massive 'before you get to your text' headers may contain printer-important information, so experiment before you commit — CS.

Saving your current directory

The DOS PATH command is an indispensable part of the operating system, allowing you to execute commands or run applications in the specified directories regardless of which directory is current. But the PATH command has at least one shortcoming. Some applications, such as Lotus 1-2-3, insist on being run from the directory containing the executable file. For these applications, a simple batch file such as the following will usually suffice:

@ECHO OFF

C:
CD \LOTUS
LOTUS

The problem with this method is that when you finish with the application, your default drive and directory have changed. If you're constantly popping in and out of the application, resetting the drive and path can become very annoying.

I therefore set out to write a batch file that would execute my application and then return to the drive and directory I started from. My initial plan was to have the batch file write a second batch file containing the appropriate CD command. After running the application, the first batch file would chain to the second. However, if I changed the drive as well as the directory, CD wouldn't be enough. I solved the problem with the PROMPT command, which can display both the logged drive and the current directory.

The batch files SETRETRN and DORETURN (Fig 4) illustrate the technique. SETRETRN creates a second batch file (ZZZZZZZ1.BAT) and executing the second file creates a third (ZZZZZZZ2.BAT). It's the third file which returns you to the starting drive and directory when called by DORETURN.

To use the batch files, put them in a directory that's on your PATH and make sure COMMAND.COM is also on the PATH. My batch files are in C:\BATCH. You should change the string C:\BATCH to reflect where you store your batch files on your disk.

K Wells

The original batch files were specifically limited to running Lotus 1-2-3. I rewrote them slightly to create the generic batch

SETRETRN and DORETURN

COMPLETE LISTING

SETRETRN.BAT

```
MPT CD %PC:\BATCH\ZZZZZZZ1.BAT
PROMPT $N: X
COMMAND /C C:\BATCH\ZZZZZZZ1.BAT C:\BATCH\ZZZZZZZ2.BAT
PROMPT $p$g
```

DORETURN.BAT

```
CTTY NUL
COMMAND /C C:\BATCH\ZZZZZZZ2.BAT
CTTY CON
DEL C:\BATCH\ZZZZZZZ2.*
```

Fig 4 SETRETRN.BAT uses the PROMPT command to write a batch file that will return you to the current drive and directory. DORETURN.BAT calls that file when you're ready to return and then deletes the temporary batch files

files you see in Fig 4. The example Lotus batch file would now look like this:

```
@ECHO OFF
CALL SETRETRN
C:
CD \LOTUS
LOTUS
CALL DORETURN
```

If you're using a DOS version earlier than 3.3, just substitute `COMMAND /C` for `CALL` and delete the `@` from the first line. Also, if you don't use `$p$g` as your standard prompt, change `SETRETRN.BAT` to restore the prompt to your own — `NR`.

Finding files

`DIR` is one of the most commonly used DOS commands, but it's also one of the most exasperating. To zero in on a file or group of files when you aren't sure of the name, you have to hunt through a long directory listing or try various combinations of the DOS wildcard characters `?` and `*` to find the files you need.

I finally wrote the batch file, `D.BAT` (Fig 5) to make it easier to find files. The idea is fairly simple. When looking for a file, you usually know something about how the filename or extension is spelled, but often just a little. Did I call my spreadsheet file `WIDGET.WK1` or `WIDGETS.WK1`? Is my database `FOOBAR.DBF` or `FOO-BAR.DBF` or `FOO_BAR.DBF`? What files have an extension of `XYZ`? Do any start with the letter `Q`? `D.BAT` can answer all of these questions quickly and easily.

You simply type the letter `D` followed by a space and whatever portion of the file name you know. For example:

You Enter	D.BAT Enters
D WIDGET	DIR /P WIDGET*
D FOO	DIR /P FOO*.*
D XYZ	DIR /P *.XYZ
D Q	DIR /P Q*.*

`D.BAT` uses the `IF EXIST` command to build up to seven different `DIR` commands. By combining your command-line input with the results of the `IF EXIST` filename search, `D.BAT` shows you the filenames most like what you are looking for.

B Holmen

D.BAT is a grand idea, but it won't necessarily show you all the files that contain your partial filename and it may show some of them twice. D2.BAT (Fig 6) is a streamlined version. Instead of calling `DIR` several times, it uses the `FOR` command to echo the name of any file that's close to what you typed on the command line.

D.BAT COMPLETE LISTING

```
@ECHO OFF
REM (remove @ in the line above
REM for DOS less than 3.3)
REM *
REM * D.BAT
REM * Dir /P with wildcards
REM *

IF [%1]==[] GOTO :Dir0

IF EXIST %1 GOTO :Dir1
IF EXIST %1.* GOTO :Dir2
IF EXIST *.%1 GOTO :Dir3
IF EXIST %1*.* GOTO :Dir4
IF EXIST *.%1* GOTO :Dir5
IF EXIST %1\*.* GOTO :Dir6

ECHO Sorry, no "%1" files found...
GOTO :End

:Dir0
Dir /P
GOTO :End

:Dir1
Dir /P %1
IF EXIST %1.* GOTO :Dir2
GOTO :End

:Dir2
Dir /P %1.*
IF EXIST *.%1 GOTO :Dir3
GOTO :End

:Dir3
Dir /P *.%1
GOTO :End

:Dir4
Dir /P %1*.*
IF EXIST *.%1* GOTO :Dir5
GOTO :End

:Dir5
Dir /P *.%1*
GOTO :End

:Dir6
Dir /P %1\*.*
GOTO :End

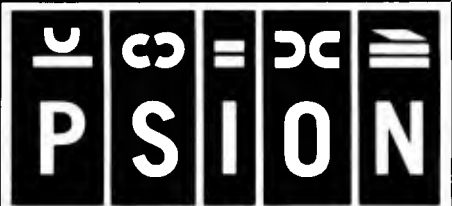
:End
```

Fig 5 `D.BAT` lists files whose names are close to the string you pass to it

D2.BAT COMPLETE LISTING

```
@ECHO OFF
SET allfiles=*.
IF [%1]==[] GOTO showfiles
SET allfiles=%1*.* %1* %1\*.*
IF EXIST %1.* GOTO showfiles
IF EXIST *.%1* GOTO showfiles
IF EXIST %1\*.* GOTO showfiles
ECHO Sorry, no "%1" files found...
GOTO End
:showfiles
FOR %v IN (%allfiles%) DO ECHO %v
:End
SET allfiles=
```

Fig 6 This is a streamlined version of `D.BAT` — it also lists files whose names are close to the string you pass to it



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DIRANY.BAT

COMPLETE LISTING

```
@ECHO OFF
IF '%2'==' ' GOTO syntax
FOR %%v IN (1 2 3 4 5 6 7 8) DO IF %2==%%v GOTO OK
GOTO syntax
:OK
SET temp=%1*.*
rem If name has 8 letters, we're done
IF %2==8 GOTO doit
SET temp=%temp% ?%1*.*
IF %2==7 GOTO doit
SET temp=%temp% ???%1*.*
IF %2==6 GOTO doit
SET temp=%temp% ???%1*.*
IF %2==5 GOTO doit
SET temp=%temp% ???%1*.*
IF %2==4 GOTO doit
SET temp=%temp% ???%1*.* *.*%1*
IF %2==3 GOTO doit
SET temp=%temp% ???%1*.* *.*%1*
IF %2==2 GOTO doit
SET temp=%temp% ???%1*.* *.*%1
:doit
FOR %%f IN (%temp%) DO ECHO %%f
SET temp=
GOTO end
:syntax
ECHO DIRANY lists files whose names contain a certain string.
ECHO Syntax: "DIRANY string n"
ECHO where "string" is a string of 1 to 8 characters
ECHO (no wildcards) and "n" is the length of that string.
:end
```

Fig 7 Pass a string to DIRANY.BAT and it will list all the files whose names contain that string

In this case, close means the file matches one of three file templates. Suppose you type

D2 WP

it would list files matching WP*.*, *.WP* or WP*.*.

DIRANY.BAT (Fig 7) takes the concept one step further — it will find any file whose name or extension contains the

string you pass on the command line. Because the batch file processor isn't terribly smart, you also have to pass the length of the string. DIRANY builds a list of file templates that cover any possible position of that string within a filename. For example, if you type

DIRANY COMPU 5

it will look for files matching COMPU*.*, ?COMPU*.*, ??COMPU*.* and ???COMPU*.*. If D.BAT and D2.BAT don't find your file, try DIRANY! — NR.

Reinitialising disks

While poking around on a bunch of old floppy disks with DEBUG, I discovered that each different formatting program I've used in the past — DOS's FORMAT.COM, The Norton Utilities' Safe Format and PC Tools Deluxe's PC Format, to name a few — places an ASCII identifier in the first sector of the disk. A disk formatted with MS-DOS 3.3 contains the string 'MSDOS3.3'; a disk formatted with Safe Disk 'IBM PNCI'; and a disk formatted with PC Format 'PCFormat'.

What's the significance of these character strings? What else is there of interest in the first sector of a disk? And finally, is there a difference in the way FORMAT.COM, Safe Disk and PC Format initialise disks?

L Feickert

The first logical sector of a DOS disk is known as the boot sector. It is used by

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Format of the boot sector

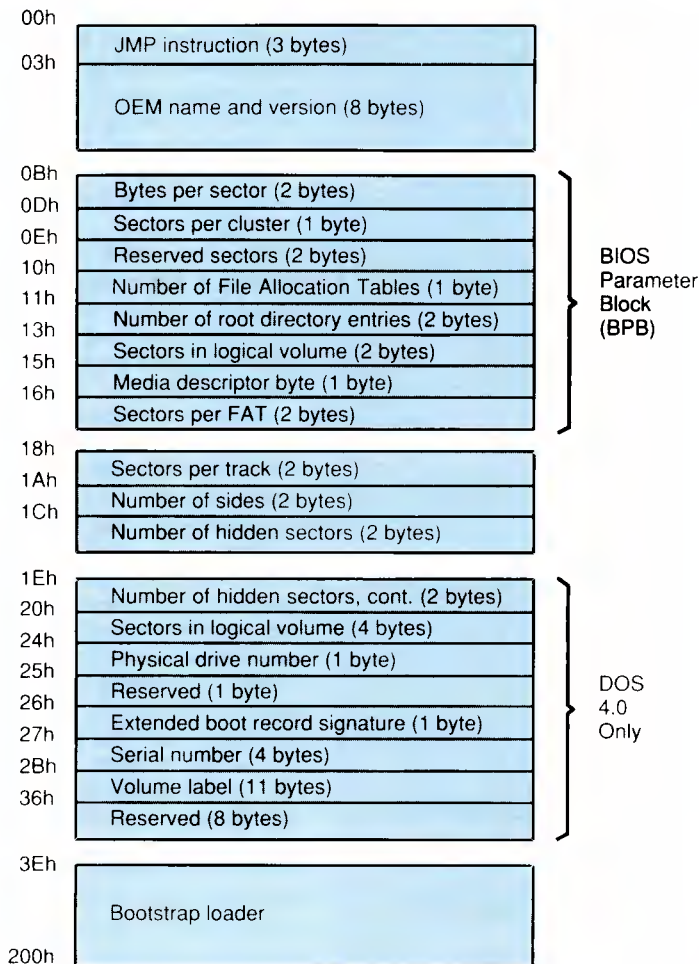


Fig 8 The first logical sector of a DOS disk, known as the boot sector, is used by DOS to store information about the media type and the structure of the file system the disk was formatted for. It also contains the bootstrap code that DOS uses to load itself from disk at start-up.

DOS to store information about the media type and the structure of the file system the disk was formatted for. It also contains the bootstrap code that DOS uses to load itself from disk during start-up.

Fig 8 shows the format of the boot sector. The first 3 bytes contain a machine language JMP instruction that transfers control to DOS's bootstrapping code. The values found there will always be E9h (the opcode for an intrasegment jump) followed by a 16-bit displacement or EBh (a short jump), followed by an 8-bit displacement and an NOP instruction (90h).

When the disk is used for start-up, the PC's ROM-based bootstrap loader reads the first sector into the computer's memory and executes the JMP instruction to initiate the bootstrapping process.

The 8 bytes starting at offset 03h in the boot sector are reserved for the name of the program or operating system that formatted the disk. Traditionally, the formatting utility writes an ASCII character string to this slot that identifies the brand and version number of the operating system.

The area spanning the range from offsets 0Bh to 17h is known as the BIOS

Parameter Block or BPB. The BPB holds everything DOS needs to know about the formatted structure of the disk: the number of bytes per sector, number of sectors per cluster, number of reserved sectors, number of copies of the file allocation table (FAT), number of root directory entries, number of sectors, the media descriptor byte and the size of the FAT in sectors.

Offsets 18h to 1Dh hold information about the physical makeup of the disk: the number of sectors per track, the number of heads or sides and the number of hidden sectors. DOS 4.0 assigns meaning to the ensuing 32 bytes as well — 2 bytes to form the high word of a 4-byte hidden sector count, 4 for the number of total sectors, 1 to record the physical drive number, 1 reserved, 1 for the extended boot record signature, 4 for the serial number, 11 for the volume label (stored as a root directory entry in previous versions of DOS) and 8 reserved for unspecified uses at the end.

In DOS 4.0, two of the fields — the sector count at offset 13h and the sector count at offset 20h — are redundant. The first field is one word long and used on formatted volumes less than 32M in size, and the second is two words long and filled in only on large (greater than 32M) volumes. Earlier versions of DOS, which did not support large volume sizes, used the entry at offset 13h exclusively.

The bootstrap code may start anywhere from offset 1Eh onward, depending on what version of DOS you're using. The job of the short program contained there is a daunting one. It loads the operating system from disk and gets the machine started using a length of code consisting of no more than 512 bytes (the length of one sector) minus the length of the BPB and other system areas.

Suffice it to say that this limitation on code length is the primary reason DOS imposes the restriction on system disks that the directory entries for the system files IBMBIO.COM and IBMDOS.COM (or IO.SYS and MSDOS.SYS) be located in the first two slots of the root directory and that IBMBIO.COM be stored in contiguous sectors starting with the first cluster.

If you're interested in exploring the bootstrap loader further and are comfortable with DEBUG, insert a system-formatted floppy disk into drive A:, start DEBUG, and type L 0 0 0 1 to load the boot sector into memory at offset 00h. Then type U 0 and resume tracing through the code at the address targeted by the unassembled JMP instruction.

Do FORMAT.COM, Safe Format and PC Format format disks the same way? Applied to a new, never-before-formatted floppy disk, yes: each one initialises the boot sector, two copies of the FAT, the

RESULTS OF DIFFERENT FORMATTING PROGRAMS

COMPLETE LISTING

(A): Original contents of disk

```

1ADD:0000 EB 34 90 49 42 4D 20 20-33 2E 33 00 02 02 01 00 .4.IBM 3.3....
1ADD:0010 02 70 00 00 02 FD 02 00-09 00 02 00 00 00 00 -- Boot Sector
1ADD:0020 00 00 00 00 00 00 00-00 00 00 00 00 00 12
1ADD:0030 00 00 00 00 01 00 FA 33-C0 0E D0 BC 00 7C 16 07
.....3.....

1ADD:0200 FD FF FF FF 4F 00 FF 0F-00 00 00 00 00 00 00
1ADD:0210 00 00 00 00 00 00 00-00 00 00 00 00 00 00
1ADD:0220 00 00 00 00 00 00 00-00 00 00 00 00 00 00
1ADD:0230 00 00 00 00 00 00 00-00 00 00 00 00 00 00
.....O.....
.....FAT

1ADD:0A00 43 4F 56 45 52 20 20-44 4F 43 20 00 00 00 00 COVER DOC ....
1ADD:0A10 00 00 00 00 00 00 00-00 00 00 00 00 00 00 -- Root Directory
1ADD:0A20 43 4F 4E 54 41 43 54 53-44 4F 43 20 00 00 00 CONTACTSDOC ....
1ADD:0A30 00 00 00 00 00 00 00-00 00 00 00 00 00 00
.....f.....

1ADD:1800 09 09 09 09 09 09 09-31 37 20 4E 6F 72 74 68
1ADD:1810 77 65 73 74 65 72 6E 20-50 6C 61 7A 61 0A 09 09
1ADD:1820 09 09 09 09 09 09 09-53 75-69 74 65 20 33 34 37 0A
1ADD:1830 09 09 09 09 09 09 09-4F 61 6B 20 52 69 64 67
.....17 North
.....Western Plaza...
.....Suite 347.
.....Oak Ridg

```

(B): After formatting with FORMAT.COM

```

1ADD:0000 EB 34 90 49 42 4D 20 20-33 2E 37 00 02 02 01 00 .4.IBM 3.3....
1ADD:0010 02 70 00 00 02 FD 02 00-09 00 02 00 00 00 00 -- Boot Sector
1ADD:0020 00 00 00 00 00 00 00-00 00 00 00 00 00 12
1ADD:0030 00 00 00 00 01 00 FA 33-C0 0E D0 BC 00 7C 16 07
.....3.....

1ADD:0200 FD FF FF 00 00 00 00-00 00 00 00 00 00 00
1ADD:0210 00 00 00 00 00 00 00-00 00 00 00 00 00 00
1ADD:0220 00 00 00 00 00 00 00-00 00 00 00 00 00 00
1ADD:0230 00 00 00 00 00 00 00-00 00 00 00 00 00 00
.....FAT

1ADD:0A00 00 00 00 00 00 00 00-00 00 00 00 00 00 00
1ADD:0A10 00 00 00 00 00 00 00-00 00 00 00 00 00 00 -- Root Directory
1ADD:0A20 00 00 00 00 00 00 00-00 00 00 00 00 00 00
1ADD:0A30 00 00 00 00 00 00 00-00 00 00 00 00 00 00

1ADD:1800 F6 F6 F6 F6 F6 F6 F6-F6 F6 F6 F6 F6 F6 F6
1ADD:1810 F6 F6 F6 F6 F6 F6 F6 F6-F6 F6 F6 F6 F6 F6
1ADD:1820 F6 F6 F6 F6 F6 F6 F6 F6-F6 F6 F6 F6 F6 F6
1ADD:1830 F6 F6 F6 F6 F6 F6 F6 F6-F6 F6 F6 F6 F6 F6
.....Data Area

```

(C): After formatting with SAFE DISK

```

1ADD:0000 EB 28 90 49 42 4D 20 50-4E 43 49 00 02 02 01 00 (.IBM PNCI....
1ADD:0010 02 70 00 00 02 FD 02 00-09 00 02 00 00 00 00 -- Boot Sector
1ADD:0020 00 00 00 00 00 00 00-00 00 00 00 00 00 12
1ADD:0030 F0 7B FB 00 C0 07 0E D0-BE 5B 00 FC AC 0A 00
.....3.....

1ADD:0200 FD FF FF 00 00 00 00-00 00 00 00 00 00 00
1ADD:0210 00 00 00 00 00 00 00-00 00 00 00 00 00 00
1ADD:0220 00 00 00 00 00 00 00-00 00 00 00 00 00 00
1ADD:0230 00 00 00 00 00 00 00-00 00 00 00 00 00 00
.....FAT

1ADD:0A00 E5 4F 56 45 52 20 20-44 4F 43 20 00 00 00 00 .OVER DOC ....
1ADD:0A10 00 00 00 00 00 00 00-00 00 00 00 00 00 00 -- Root Directory
1ADD:0A20 E5 4F 4E 54 41 43 54 53-44 4F 43 20 00 00 00 CONTACTSDOC ....
1ADD:0A30 00 00 00 00 00 00 00-00 00 00 00 00 00 00
.....f.....

1ADD:1800 09 09 09 09 09 09 09-31 37 20 4E 6F 72 74 68
1ADD:1810 77 65 73 74 65 72 6E 20-50 6C 61 7A 61 0A 09 09
1ADD:1820 09 09 09 09 09 09 09-53 75-69 74 65 20 33 34 37 0A
1ADD:1830 09 09 09 09 09 09 09-4F 61 6B 20 52 69 64 67
.....17 North
.....Western Plaza...
.....Suite 347.
.....Oak Ridg

```

(D): After formatting with PC FORMAT

```

1ADD:0000 EB 3E 90 50 43 46 6F 72-6D 61 74 00 02 02 01 00 .>.PCFormat....
1ADD:0010 02 70 00 00 02 FD 02 00-09 00 02 00 00 00 00 -- Boot Sector
1ADD:0020 00 00 00 00 00 00 00-00 00 00 00 00 00 12
1ADD:0030 00 00 00 00 00 00 00-00 00 00 00 00 00 00
.....P.....

1ADD:0200 FD FF FF 00 00 00 00-00 00 00 00 00 00 00
1ADD:0210 00 00 00 00 00 00 00-00 00 00 00 00 00 00
1ADD:0220 00 00 00 00 00 00 00-00 00 00 00 00 00 00
1ADD:0230 00 00 00 00 00 00 00-00 00 00 00 00 00 00
.....FAT

1ADD:0A00 00 4F 56 45 52 20 20-44 4F 43 20 00 00 00 00 .OVER DOC ....
1ADD:0A10 43 7A 53 61 76 00 3A AB-BD 13 02 00 00 03 00 00 CxSav.4.....
1ADD:0A20 00 4F 4E 54 41 43 54 53-44 4F 43 20 00 00 00 CONTACTSDOC ....
1ADD:0A30 43 7A 53 61 76 00 3A 97-66 13 03 00 2E 04 00 00 CxSav..f.....

1ADD:1800 09 09 09 09 09 09 09-31 37 20 4E 6F 72 74 68
1ADD:1810 77 65 73 74 65 72 6E 20-50 6C 61 7A 61 0A 09 09
1ADD:1820 09 09 09 09 09 09 09-53 75-69 74 65 20 33 34 37 0A
1ADD:1830 09 09 09 09 09 09 09-4F 61 6B 20 52 69 64 67
.....17 North
.....Western Plaza...
.....Suite 347.
.....Oak Ridg

```

Fig 9 When applied to a preformatted disk, both The Norton Utilities' Safe Disk and PC Tools' PC Format preserve data by simply erasing any existing files rather than reinitialising the root directory and the area where file data is stored. By contrast, DOS's FORMAT.COM completely reinitialises the disk, rendering any files that were previously stored there unrecoverable by conventional means

root directory, and the portion of the disk where file data is stored using nearly identical methods.

But how these utilities format disks that have been previously formatted varies substantially. FORMAT.COM treats a preformatted disk the same as it does a new one, completely reinitialising it from start to finish, and in the process, rendering any existing data on the disk un-

recoverable. Safe Format and PC Format, by contrast, preserve data on a preformatted disk by simply erasing existing files rather than overwriting them. The result: since erased files can be restored using any one of a number of unerase utilities, files on disks formatted with Safe Format or PC Format can be successfully recovered after an accidental format.

The sector maps in Fig 9 illustrate why.

AUSTRALIAN PERSONAL COMPUTER

Fig 9(a) shows a DEBUG-type hex dump of selected portions of the boot sector, FAT, root directory and data area of a freshly formatted 360K disk containing two files — COVER.DOC and CONTACTS.DOC. The disk was formatted with PC-DOS 3.3's FORMAT.COM. The OEM identification field in the boot sector bears DOS's identifying mark, while the FAT and root directory contain entries for the two files and the data area holds the actual bytes that make them up.

Fig 9(b) shows the same areas after the disk is reformatted with FORMAT.COM. The FAT, root directory and data area have been reinitialised. The root directory, which previously held filename entries for COVER.DOC and CONTACTS.DOC, now holds all zeros. And all bytes in the data area have been replaced with the value F6h.

Figs 9(c) and 9(d) show what the disk would look like had it been reformatted with Safe Format and PC Format, respectively, using each utility's default formatting parameters. Both programs reinitialise the boot sector (as evidenced by the strings 'IBM PNCI' and 'PCFormat' in the boot sector) and the FAT, but leave the root directory and data area largely intact. Rather than destroy files the way FORMAT.COM does, Safe Format and PC Format erase them by replacing the first character in each filename with E5h and zeroing the corresponding entries in the FAT. For all outward appearances, the root directory is just as empty as on the disk reformatted with FORMAT.COM. But the original files on the disk reformatted with Safe Format or PC Format still reside physically on the surface of the disk where they can be recovered should the need arise. Those on the disk reformatted with FORMAT.COM cannot.

Another reason to use a smart formatting utility — one that leaves the root directory and data areas intact on a disk that isn't being formatted from scratch — is that it allows the formatting process to proceed much faster. Safe Format and PC Format format preformatted disks much faster than FORMAT.COM. Both programs also offer additional quick-formatting options, which not only speed the format up further, but leave even more of the original contents of the disk intact. Safe Disk's Quick Format option, for example, leaves the contents of the boot sector unmodified, working only in the FAT and root directory. PC Format's/Q option does the same — JP.

Excel

Editing the Excel Formula Bar with the mouse can be a test of dexterity. It might actually be impossible for a physically impaired user.

The Microsoft manual doesn't mention that the insertion bar can be manipulated with arrow keys. The trick is to activate the Formula Bar first with Command-U instead of with the mouse. Once activated from the keyboard, the left and right arrows will then move the insertion point one character. With the Command prefix, the left/right arrows move one field per stroke. This field can be a word, a space, a symbol or a cell reference, for example. With the Shift prefix, the region through which the bar moves is extended and highlighted in the usual way.

J Glassman

FreeHand

With FreeHand 2.02 on the Mac, the most common technique for repeating elements in a closed path is to duplicate them as many times as required to fill the space, cut these elements to the Clipboard and finally use the Paste Inside function to create the effect. However, the Tiled Fill option is faster and makes it easier to adjust the spacing of the masked elements (see Fig 10).

In a dialogue box you get when you select Tiled from the Fill menu, you can modify only scaling, angle and offset

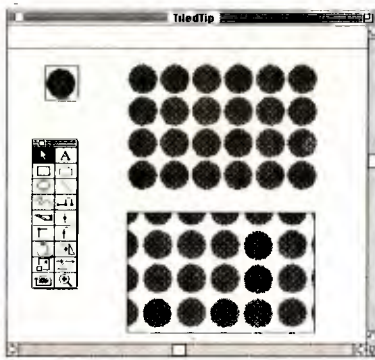


Fig 10 Instead of creating enough of a repeating shape or pattern in FreeHand to fill a closed path, use a tiled fill. Which would you rather create: the single tile on the top left or the four rows of objects on the right?

properties. The problem is that you cannot control spacing between the repeated elements of a tile. Here's a way to bypass this limitation:

1. Create your tile (text, paths and so on). Make sure your elements are ungrouped.

2. Draw a square or rectangle around your tile, and align all elements to the square horizontally and vertically centred (you may have to group your elements to do this easily).
3. Select your square and set the line to None on the Line menu.
4. Ungroup everything and cut to the Clipboard.
5. Select the path to fill, choose Tiled on the Fill menu and click on the Paste In button in the Tiled dialogue box. As with the Edit menu's Paste Inside function, you won't be able to see your results unless you're in Preview mode.

If the tiled graphic you've created doesn't tile correctly to form a pleasing pattern, you can easily change the spacing now. To edit the distance between objects, select the path, choose the Tiled command and click on Copy Out. Paste the ungrouped elements back onto the document. You can now modify the height or width of your square to change the way the element or elements will be tiled into a pattern. Once you're satisfied, paste the elements back into your fill.

J Desrochers

END

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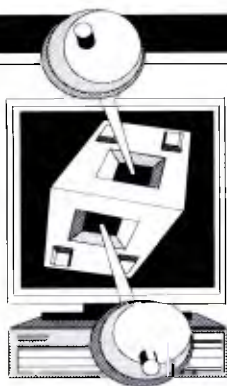
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president's daughter and hauls her off to a secret warehouse. It is your job to rescue her and in the process rid our cities of the drugs and thugs that Mr Pin controls. Sandwiched between storyboards describing the plot, are intense episodes of arcade action, where you'll battle the likes of Eddie The Lump, the Evil Ninja and K909.

You are not defenceless. Armed with weapons, including a five-shots-at-once machine gun and an awesome rocket launcher, and protected by a powerful shield, you make your way deeper and deeper into the infested town. Ammo, your shield, and lives are all renewable resources. The first two can be scooped up as they drop from the top of the screen (heaven?), and the latter are stashed in various places around the city.

The arcade action ranges over a variety of different settings. The play begins in a railroad yard (watch out for snipers in the coaches), and moves on through a ghetto, a weapons plant, a drug factory, a subway station and finally ends up in King Pin's mansion. Along the way, doors lead into dark and dangerous bonus rooms where laser beams and kinetic death pads present puzzles and obstacles you must overcome if you are to complete the rescue. Don't skip the bonus rooms, since they contain some useful supplies.

In addition to the 3000 points you get for surviving each bonus room, other points are awarded for blowing away various villains like Eddie T. Lump, who counts for a measly 500, and The King Pin himself, who goes for a cool 25,000.

Crime Wave keeps score, allowing you to save your name and points after successfully completing the game. Crime Wave will not, however, allow you

Crime Wave

Computers: IBM and compatibles
Distributor: Ozisoft
Price: \$69.95

What do you get when you cross an adventure game with an arcade game? Crime Wave. This latest thriller from Access Software has a plot like an adventure game and all the shoot 'em up action of an arcade classic. If that is not enough to get you to pull the box off the shelf, maybe the fact that Crime Wave uses stunning VGA graphics of nearly photographic quality and Access's sound system (RealSound), which makes an ordinary PC sound like it has a music card, will.

As the story unfolds — or rather flashes by in animated cells — Mr King Pin, boss of a nationwide crime cartel, kidnaps the



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to save anything else, such as a game in progress, which means you'll have to complete your rescue in one sitting. That's just one of several inconveniences I found in an otherwise excellent product. The others: it doesn't support joysticks, it requires a hard disk and it can be ridiculously slow on a slow computer (although you can choose to play a subset of Crime Wave that includes just the arcade action).

Once you master the beginner's level

of play, you progress to two more-difficult levels. At the novice level, you may be attacked by only three or four gangsters at once. Ammo floats down at a slow rate, and you can take many hits before you expire. At the most difficult level, you must fight off waves of attackers. Supplies seem to be hurled at you too rapidly to scoop up, and one or two hits can do you in.

From the first notes of Crime Wave's opening music (you'll swear it's Pink

Floyd, but it isn't) to the last animated scene on a tropical island, you'll be astonished at how far computer games have come since the early hit, Pong. With its breathtaking graphics and surprisingly good sound — which requires no additional hardware — Crime Wave is a worthy addition to Access's series of state-of-the-art games. If you have a hard disk drive and a VGA or EGA card, this is a game you'll want to own.

Don Trivette

The designers of Tetris, last year's popular arcade game from the Soviet Union, has introduced a 3-D sequel called Welltris. In the best capitalist tradition, a Polish designer has countered with his own version of 3-D Tetris. What hath glasnost wrought?

The idea behind Welltris is to position blocks and drop them down a well. When a row on the bottom of the well is filled with blocks, the row disappears. Your score mounts as you eliminate rows.

The secret to racking up megapoints is to fit the blocks into the 8 by 8 grid marked off on the bottom of the well, thus avoiding a pileup of blocks along the sides.

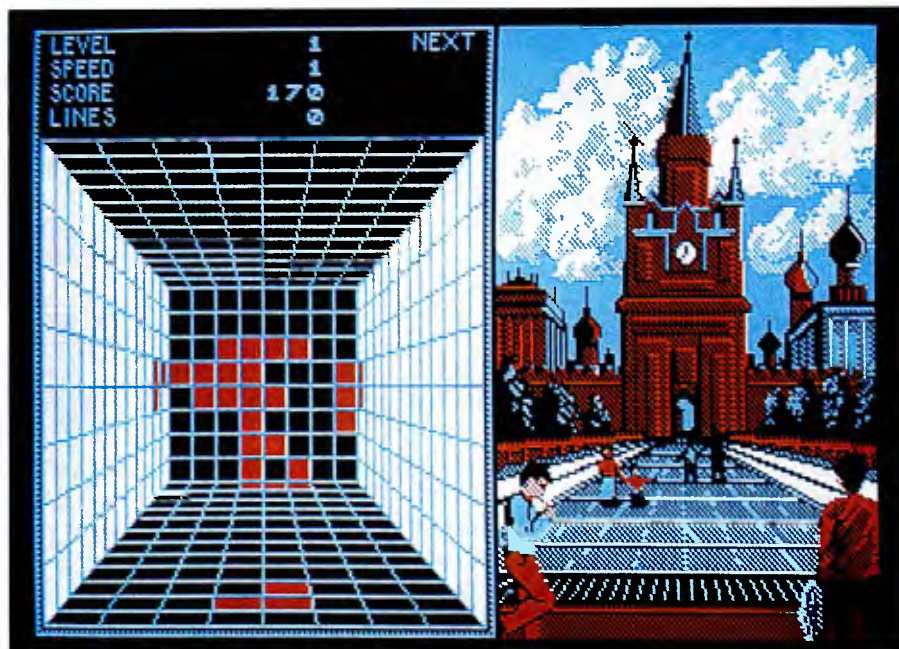
Once blocks have encroached on all four sides, the game ends. As in the original Tetris, more points are awarded for blocks dropped from the top of the well than for those you allow to slide down the wall and skid into place.

I loved 2-D Tetris and was excited about playing a 3-D version, but my enthusiasm soon cooled. Welltris isn't what I thought it should be. Although the well itself is shown in 3-D perspective, the blocks are 2-D — they have no thickness — and consequently there's no 3-D challenge. This is a two-dimensional game played on a three-dimensional board.

A figure dropped from a position spanning two walls — dropped from the corner — breaks into two different shapes when it hits the floor. That's about the only new twist Welltris has over Tetris.

Blockout was inspired by the Danish mathematician Piet Hein. He pointed out that a total of seven different irregular shapes can be formed by combining three or four cubes. These shapes can be fitted together to form a 3 by 3 by 3 cube that he called the Soma Cube.

Once again, you are called upon to drop blocks into a pit, but these blocks — components of the Soma Cube — have width, height and depth. You can manipulate the blocks through all three dimensions as they slowly descend into a hole, which measures 3 by 3 by 6 blocks



deep. As you work to cover a layer in the pit — thereby causing the layer to disappear — you must also take into account how the shapes will fit (or more often fail to fit) into other layers.

This is a two-handed game: your right hand (on the cursor keys) moves a block around its x-y plane, while your left hand fumbles with the A, S and D keys to spin a block in a clockwise direction around its x, y or z-axis. The right-hand controls are no different from dozens of other arcade games, but the left-hand manipulations are awkward. It takes considerable hand-eye-brain co-ordination to get the hang of spinning an object in three dimensions.

Points are awarded based on the height from which a block is dropped and the complexity of its shape. Once you've mastered Blockout's basic level, you can advance to larger pits and more-complex shapes composed of as many as five cubes. Blockout is what Welltris should have been: a Rubik's cube of an arcade game that will give you hours and hours of frustrating delight.

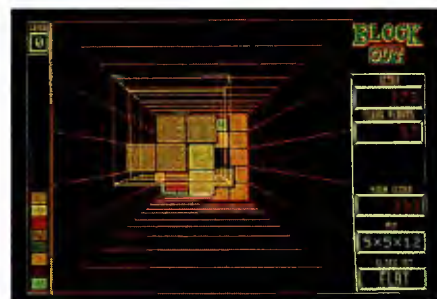
Don Trivette

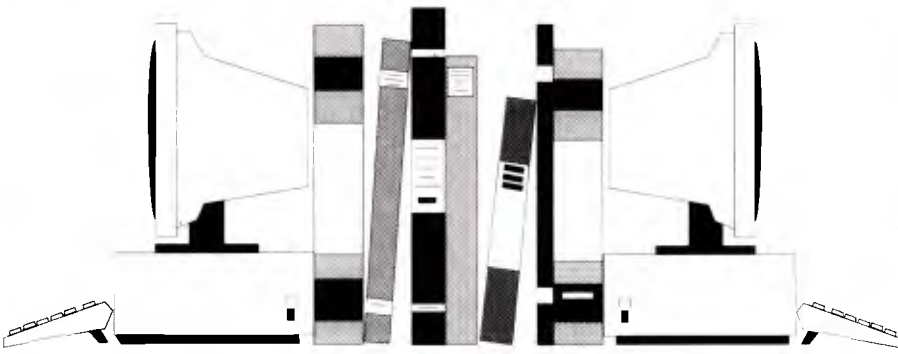
Welltris

Computers: IBM/Mac
Distributor: Ozisoft
Price: \$69.95

Blockout

Computers: IBM/Amiga
Mac/AtariST
Commodore
Distributor: Electronic Arts
Price: \$49.95





Communications is one of those specialised areas of computing that can be off putting to many. This month our reviewers assess some of the literature available on telecommunications and data communications.

Learning to communicate

Data Communications, Computer Networks and OSI

Author: Fred Halsall
Publisher: Addison-Wesley
ISBN: 0-201-18244-0
Price: \$44.95

The ISO standards for data communications are of growing importance to people involved with communication networks, so it is pleasing to see that the second edition of this book has expanded its coverage of this area and the rapidly evolving ISDN protocols.

The book has been compiled from lecture notes given by the author and is structured in a manner suitable for a course. The theory behind data communications is handled from bottom-up, working its way from the physical connection and signal transmission to the application and presentation layers of the OSI model.

The text is primarily concerned with the theory used in data communications, and little reference is made to networking methods commonly in use. SNA and DNA, two very popular network architectures, rate only a passing mention, despite the fact that they appear to be used as the basis for discussion on block and character-based protocols.

The three topics described in the title are covered equally in the three parts of the book. Unfortunately, this means that data communications and networking are not discussed with reference to the OSI

model, but rather they are analysed separately with only a small summary of the standards activities provided. Moreover, descriptions of the standards activities refer to the various committees (ie, IEEE 802.2, 802.5) but do not mention the actual names of the technologies used.

The text is sparsely indexed and of little use as a reference. Rather, it has been written for working through and understanding the underlying theory of data communications.

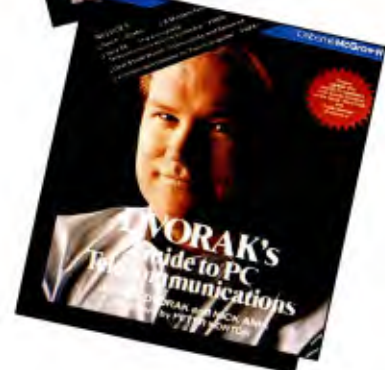
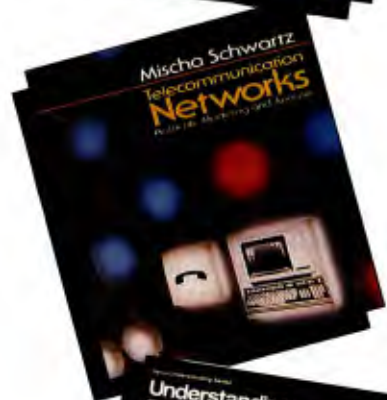
This book is suitable for students studying electronic engineering or computer science. While little knowledge is assumed, an understanding of basic electrical transmission concepts would be helpful. If you are involved with implementing network solutions, this book may be useful for background study.

David Aitken

Telecommunication Networks — Protocols, Modeling and Analysis

Author: Mischa Schwartz
Publisher: Addison-Wesley
ISBN: 0-201-16423-X
Price: \$49.95

Doctor Schwartz has been involved in the field of communications for over 40 years, during which he has received numerous awards for education. This breadth of experience and, more importantly, the ability to share it, has resulted in a well



structured and understandable book on telecommunications.

The often separated fields of voice and data communications are both dealt with in this one volume. As the text is structured around the OSI model, the book begins with an overview of layered network protocols with specific reference to the OSI model, IBM's SNA and the X.25 interface standard. Rather than address the whole range of issues covering each layer of the OSI model, the author restricts himself to layers two, three and four — the data link, network and transport layers.

Practical examples of many of the protocols discussed are given. While the examples are not exhaustive, they do help relate theory to communication methods commonly in use, and particular attention is given to local and metropolitan area networks.

The discussion is mainly involved with quantitative examination of networks, and the techniques for analysis and performance evaluation. A basic understanding of probability theory is a prerequisite, as queuing theory is introduced within the text.

The book closes with a discussion of

integrated voice and data networks. Surprisingly, little space is devoted to this important subject, especially considering the coverage of both packet and circuit switched networks individually. This could be attributed to the fact that the last reprint was in 1988. A future revision will hopefully devote more attention to this topic, and ISDN in particular.

The text is extremely well cross-referenced to related publications. If the answer cannot be found here, it will at least suggest a good lead to follow. *Telecommunications Networks — Protocols, Modeling and Analysis* should be of value to professionals becoming involved in the communications field.

David Aitken

Understanding FAX and Electronic Mail

Author: Michael Banks
Publisher: Pergamon Press
ISBN: 0-672-27297-0
Price: \$41.00

This is an American book about Fax and online E-mail services. It is not about E-mail on local area networks (LANs), nor of

what happens and what is available in Australia.

In most areas of computing, it doesn't matter much where a book is written. Most English speaking countries use the same sorts of computers and similar software, but in telecommunications things are different. Each country has its own common carriers — in Australia's case Telecom — and its own regulations about what you can attach to the common carrier's lines. Because of the differences between Australia and the US, *Understanding Fax and Electronic Mail* is not very relevant to readers here.

The most useful material in the book is about how fax machines and online electronic mail services work. Banks talks about the components of a fax machine and how they work together to transmit an image of your page to another fax machine. He looks at the different types of fax machines and PC fax cards, and provides the facts you need to make an intelligent choice. However, all the suppliers and prices listed are all US and again, have no relevance here.

The section on E-mail is even less useful for Australian readers. While the way things operate in Australia is broadly

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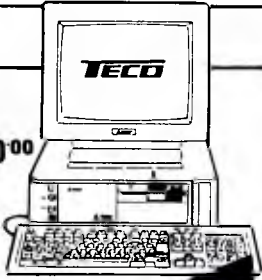
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similar to those in the US, the particulars are different. For example, all the examples quoted are for US services like MCI Mail and CompuServe. While some Australians do use these services, many more use local services like Discovery.

Don't buy this book unless you are desperately interested in the inner workings of a fax machine.

Jeremy Horey

Understanding Data Communications

Authors: George Friend, John Fike, Charles Baker and John Bellamy

Publisher: Pergamon Press

ISBN: 0-672-27270-9d

Price: \$36.95

The authors of this book have provided a comprehensive survey of the whole field of data communications. *Understanding Data Communications* starts with 'An Overview of Data Communications', which covers the basics of how information is transferred between computers. It also has a good case study of one company's changing data communications needs and the solutions the company came up with.

From there, the book goes on to look at terminals, telecommunications and networks. Although originally published in 1988, *Understanding Data Communications* was updated with a second edition in 1989 and is reasonably up-to-date. It covers such topics as fibre optics and satellite communications as well as the latest advances in modem technology.

Unfortunately, the tone is very dry and academic. The authors begin each topic with an examination of the history of the subject and then proceed to explain the theory of communications. It is the sort of book that is useful to have on your shelves as a reference more than anything else.

Although *Understanding Data Communications* is written from an American perspective, it concentrates on the theory of communications. The examples are for illustration and are not meant as a guide for users.

Jeremy Horey

Dvorak's Guide to PC Telecommunications

Author: John Dvorak and Nick Anis

Publisher: McGraw-Hill

ISBN: 0-07-881551-7

Price: \$95

This is a big book — 1053 pages — pages of discount coupons for software

programs, hardware and services and two disks crammed with more than 1M of software. Maybe the dedication 'For all mankind' really does say it all.

Dvorak and Anis (and the dozens of other authors mentioned in the acknowledgements) have set out to write the definitive volume on telecommunications. From the broad outline of a layman's view to the technical details on how a file transfer protocol works, no topics are left uncovered.

Such a massive project could have become out of hand, but the authors have actually pulled it off. The book is readable, comprehensive, useful and detailed. Rather than adopting a linear approach with an introduction to each topic, followed by detail with topics arranged in logical order, the book is more like a series of layers. There is much repetition as topics are covered in greater detail in each layer, but this builds the reader's understanding rather than contributes to confusion.

Dvorak and Anis are men with a mission. They believe in the power that telecommunications brings to the individual and they want everyone to get 'online'. The reader is encouraged to try things, to use the software, and to communicate. And this is what the first section, 'A Layman's View', is all about. It gives you enough information to get you, your communications software and your modem up and running.

As you get deeper in you can turn to the excellent 'User Guides' section that covers the workings of all the programs included with the book, or to the 'Technical View' which covers the guts of how things work as well as a useful section on 'Troubleshooting Your Modem'.

At the end of the book is a series of appendixes. There is a whole range of useful information and a very comprehensive glossary of telecommunications terms.

However this is an American book. It deals with telecommunications in the US and not in Australia. Telephone numbers, prices and contacts are all American and are of little use to Australians. Unless you want to pay international phone charges, you won't be able to use the services listed, and will have to find your own local bulletin boards, electronic mail services and on-line database services.

Normally I wouldn't recommend a book on this subject that had such a failing, but it is so well written and so useful that I have no hesitation in recommending it to Australian readers. Above all, it is inspiring — it makes you want to get out there and telecommunicate.

Jeremy Horey

END

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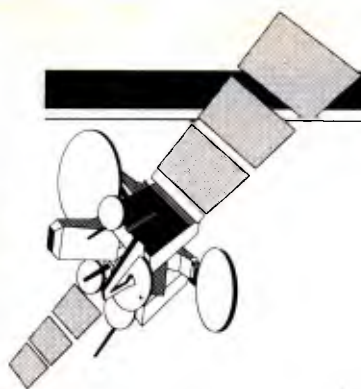
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Borland online

Borland Pacific is now running a BBS to provide local access to much of the material available on the Borland International BBS. This includes information, files and utilities relating to Borland products. Although technical support is not currently available through the board, it is planned for the near future.

Operated by Mark Pountley, the system runs Galacticom's Major BBS software, and other details are shown below under 'New Systems — NSW'.

Mark is looking for boards in other states to carry the same material. If you are a sysop with plenty of disk space and are interested, contact him through the board or at Borland Pacific (tel (02) 418 7330, fax (02) 418 7307).

New Systems

Thanks to Rodney Creer, David Applegate, Mark Pountley, Rudi Rolih and an anonymous caller.

NSW

Ada Association of Australia (02) 887 4281. MV. Rudi Rolih. V22, V22bis. 24 hours daily.
Autodesk Animator User Group (AAUG) (02) 554 3376. MV. Richard Williams. V22, V22bis.
Borland (02) 418 7450. P. Mark Pountley. V21, V22, V22bis, V23 (NetComm 1234SA). 24 hours daily.
Calmer1 BBS (02) 482 1716. P. Claude Almer. V21, V22, V22bis.
Crystal Circuitry (02) 868 4490. MV. Mun-Wai Low. V21, V22, V22bis, V23.
Hypex Electronics BBS (02) 807 6708. P. Steve Davis. V21, V22, V22bis.
The 10 Forward BBS (02) 636 6627. P. Darryl Adams. V21, V22, V22bis, V23. FidoNet 3:713/601. 3pm-9am daily.
The Castle (02) 57 2153. P. Ray Cooney. V21, V22, V22bis. 9pm-7am daily.

ACT

The Night Fantastic (06) 254 7779. P. Nat Wong. V21, V22, V22bis. 10pm-7am daily.

Vic

After Dark (03) 336 1154. P. Robert Euston. V21, V22, V22bis, V23. FidoNet 3:635/522. 8pm-7am daily.
Decadence (03) 794 7949. P. 'Inka Princess'. V21, V22, V22bis, V23.
The Lightning BBS (03) 399 1030. P. 'Thunder'. V21, V22, V22bis, V32.
The Pheonix Comsystem (03) 532 8029. P. V21, V22, V22bis, V23, V32.
ComZtel (057) 84 2155. P. Maurice Copeland. V21, V22, V22bis, V32.

Qld

The Games Machine BBS (074) 98 6942. P. David Applegate. V21, V22, V22bis, V23, Bell 103, 212, 2400. 5pm-9am weekdays, 24 hours weekends.
The Two Tees BBS (07) 372 8821. P. Terry Wilson. V21, V22, V22bis, V23. 8pm-5am daily.
Circuit Board (077) 21 1872. M. Edwin Knox. V21, V22, V22bis, V23.

SA

Adelaide Amiga Users Group BBS (08) 297 0478. MV. Jonathon Potter. V22, V22bis, Bell 103, 212. FidoNet 3:680/829.
Alternate Reality (08) 254 2535. P. Robin Hansen. V22bis.
DISCUSS BBS (08) 295 8983. P. Greg Harry. V22bis. FidoNet 3:680/830.
ISC — The Adelaide Mailbase (08) 269 1242. P. David Wallace. V22, V22bis. FidoNet 3:680/827. 8am-midnight daily.
The Matrix BBS (08) 49 1741. P. Brenton Pudney. V21, V22, V22bis, V23. FidoNet 3:680/823. 10.30pm-7.30am daily.
The Starship Enterprise BBS (08) 43 3878. P. Steven Goldsmith. V21, V22. 11pm-6am daily.
Thistle Dome (08) 322 2716. M. Rod Gasson. V21, V22, V22bis, V23.

WA

Xenon Connection CBIS (09) 291 7967. P. Denis Cheong. V21, V22, V22bis, V23, Bell 103, 212. FidoNet 3:690/616. 2.30pm-6am daily.

Updates

NSW

Amiga Connection BBS Club (02) 744 6010. MV. Mario Nicotra. V21, V22bis, V23, V32.
APOLLOLINE AUSTRALIA SL BBS Possibly offline.
Display Systems Australia BBS (02) 317 4937. MV. Michael Butler. V21, V22, V22bis, Bell 103, 212, Trailblazer. FidoNet 3:712/515.
Eden (02) 699 3717. MV. David Luong. V22, V22bis, Bell 212, Trailblazer. FidoNet 3:712/631.
HomeGrown QuickBBS (02) 554 3203. P. David Heaps. V21, V22, V22bis, V23, Bell 103, 212. FidoNet 3:712/214.
Imagineering BBS (02) 697 8599. MV. Chris Moran. V21, V22, V22bis, V23, Bell 103, 212. FidoNet 3:712/626.
Programmers BBS (02) 875 1296. M. Felix Tsang. V22, V22bis, V23. FidoNet 3:711/809.
Software Tools (02) 449 9477. Bill Bolton. Mailer only — not a normal BBS.
Sorcerer Users Group (02) 626 8020. MV. John Cepak. V21, V22, V22bis. FidoNet 3:713/607.
Sydney PC Users Group — QUINDEM OPUS (02) 698 8769. M. Chris Kelly. V21, V22, V22bis, V23. FidoNet 3:712/602. Formerly PC Users Group — Microcomp Board.
SYDTRUG Club-80 BBS (02) 332 2494. MV. Michael Cooper. V21, V22, V22bis, V23, Bell 103, 212.
The EAGLES (02) 745 3190. MV. T. Harvey. V21, V22, V22bis, Trailblazer. FidoNet 3:712/704. Formerly Eagle One.
The Kiwi Konektion (02) 906 1445. P. Robert Earle. V22, V22bis. FidoNet 3:712/506.9. 5pm-9am weekdays, 24 hours weekends.
The Network Connection BBS (02) 416 1078. P. Anthony Ford. V21, V22, V22bis. FidoNet 3:711/504.
the OMEN (02) 639 7862. P. Andrew Romer. V21, V22, V22bis, V23, V32. FidoNet 3:713/617.
Beauford BBS (047) 58 6542. P. Roger Cooper. V21, V22, V22bis, V23.
PALANTIR BBS — On the Bauder! (060) 41 1416. P. Steve Sharp. V21, V22, V22bis, V23, Bell 103, 212. FidoNet 3:712/207. 24 hours daily.

Vic

Antimatter BBS (03) 754 3080. P. 'The Quasarman'. V21, V22, V22bis. 11pm-5pm daily.

Atropos (03) 887 1485. MV. 'Nils Desperandum'. V21, V22, V22bis, V23. Formerly Mercury BBS.

Chicago Offline.

Delta BBS (03) 836 6659. P. 'Big Mother'. V21, V22, V22bis, V23. 24 hours daily.

Gamma Computer Systems (03) 885 6227. P. Bill Jansen. V21, V22, V22bis, V23.

Micronet Information System (03) 741 9055 (4 lines). P. Luke Groeneveld. V21, V22, V22bis, V23. FidoNet 3:635/505.

Nemesis BBS (03) 331 1155 (8 lines). P. 'Amphion' and 'Riddler'. V21, V22, V22bis, V23.

Nuclear Confusion BBS (03) 822 2919. P. Paul Johnson. V21, V22, V22bis, V23. 24 hours daily. Formerly MacInsight.

PC Connection Australia (03) 388 0909. MV. L Borrett. V21, V22, V22bis, V23. FidoNet 3:632/330. Also (03) 388 0133 (4 lines), V22, V22bis, V32.

Photography Support Australia #1 (03) 808 0147. P. Gareth Shaw. V21, V22, V22bis, Bell 103, 212. FidoNet 3:636/401. 8pm-7am weekdays, 24 hours weekends and public holidays. Formerly The Frankston Exchange Opus BBS.

Ratz BBS (03) 563 8117. MV. Howard Alexander. V22, V22bis, Bell 103. FidoNet 3:633/301. Formerly The Central Scrutinizer.

The Bear Essentials (03) 877 7333. P. Paul Ridley and Jenny Moloney. V21, V22, V22bis, V23. FidoNet 3:633/365.

The Black Board (03) 776 5206. P. 'Negative Energy'. V21, V22, V22bis, V23.

The Elite BBS (03) 489 8131. P. Gary Finlayson. V21, V22, V22bis, V23.

The Thin Red Line (03) 311 7317. P. Dale Robinson. V21, V22, V22bis, V23, V23ORG. FidoNet 3:636/316.

The Wastelands (03) 309 4047. MV. Colin Berg. V22, V22bis. FidoNet 3:635/501.

A & C Land (053) 42 0807. P. Stephen Walsh. V21, V22, V22bis, V23, Bell 103, 212. 7.30pm-6.30am weekdays, 24 hours weekends. Enter '0' for NEW accounts, '?' for menus.

Eastern Plains BBS (051) 76 1125. M. Martin Taylor. V22, V22bis, Bell 212. FidoNet 3:632/311. 10am-11pm weekdays, 24 hours weekends.

Omega BBS/Vortex Host (052) 23 1671. P. Mark Gregson. V21, V22, V22bis, V23, Bell 103, 212.

The Boolean Board Offline.

Submissions

The material in this column is presented in good faith, but as it is collated from material obtained from a variety of sources, APC cannot take responsibility for its accuracy.

New information and corrections are always welcome (but please mention whether or not you can vouch for the accuracy of the material provided) and should be sent to the attention of Steve Withers at one of the following addresses: Computer Publications, 122 Ormond Road, Elwood 3184; FidoNet, 632/305 (Brainstorm Oz! (03) 758 7086).

Acknowledgements will be made through this column. APC exchanges information with the Australian BBS Registry, but if you wish to contact the registry co-ordinator directly, he can be reached at FidoNet 680/808 (Australian Bulletin Board Registry, (08) 281 0433).

Qld

Blue Lagoon II — QLD (07) 849 6724. P. David Webb. V21, V22, V22bis, V23. FidoNet 3:640/943. Formerly Blue Lagoon.

Dove System (07) 261 2481. MV. Daniel Churchman. V21, V22, V22bis, V23, Bell 103, 212. FidoNet 3:640/777.

Future Dimensions BBS (07) 368 3046. P. Russell Craine. V21, V22, V22bis, V23.

Radio Experimenters Group BBS (07) 273 7081. MV. Chris Joyce. V21, V22, V22bis, V32, Bell 103, 212 (MNP 1-4). FidoNet 3:640/273.

The Galaxy GateWay Computer System (07) 207 8900. MV. James Collins. V21, V22, V22bis, V23, V32, Trailblazer. FidoNet 3:640/316.

LANAI Offline.

Moonbase BBS (075) 58 1108. MV.

Malcolm Harvey. V21, V22, V22bis, V23, Trailblazer. FidoNet 3:640/581.

SA

ADAM (08) 370 5775. MV. Greg Hicks. V21, V22, V22bis, V23, V32. FidoNet 3:680/805.

Nexus III (08) 243 2477. M. V21. Formerly Nexus.

Oracle PC-Network (08) 234 0791. MV. Grayham Smith. V21, V22, V22bis, V23. FidoNet 3:680/804.

The Edge (08) 255 0697. P. Tony Sander. V21, V22, V22bis. 8pm-7am daily. Formerly The Data-Dump BBS.

The Hang Out BBS Offline.

The Void (08) 388 5702. P. Plembardian. V21, V22, V22bis, V23. FidoNet 3:680/819. Formerly BLACK Vold — Lal Of ChAmPiOns.

Township Of ComputerRun BBS (08) 297 1385. P. David Walters. V21, V22, V22bis. FidoNet 3:680/825. 8pm-2am Wed-Sun.

NT

Amiga Retreat (089) 45 1516. P. Mark Keogh. V21, V22, V22bis. FidoNet 3:690/648. 7pm-10am weekdays, 24 hours weekends.

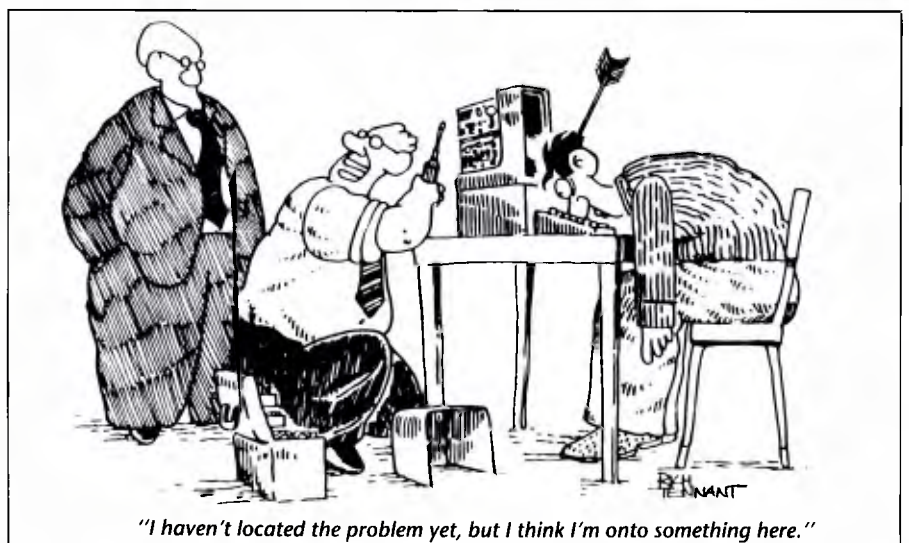
Diversion BBS (089) 45 2246. P. Trevor Hopps. V21, V22, V22bis, V23, Bell 103, 212. FidoNet 3:690/642. 24 hours daily.

WA

Perth Omen (09) 244 2111. MV. Mark Dignam and Mick Howland. V21, V22, V22bis, V23, V23ORG. FidoNet 3:690/636. 24 hours daily.

Tower BBS (09) 250 1854. P. Lindsay Blume. V21, V22, V22bis, V23. FidoNet 3:690/634.

END



"I haven't located the problem yet, but I think I'm onto something here."

DIARY DATA

Conferences

July

9-13 World Conference on Computers in Education This conference organised by the University of Western Sydney will bring together computer educators from around the world. *Enquiries, Toni Downes, tel: (046) 203 180*

14-15 Econet '90 Conference Econet '90 will look at the past decade's development of educational computing in areas such as windowed software, faster Econet networks and improved sound and graphics. *Enquiries, Tony Salvas, tel: (03) 419 2892*

25-27 Australia Bull Users Group Conference This group is holding its conference and exhibition at the Hilton in Melbourne. *Enquiries, Australian Convention Management Services, tel: (02) 332 4622*

August

5-8 Australian Computer Conference 1990 Conrad Hotel on the Gold Coast is the venue for ACC '90 which has as its theme "Designing and implementing computer systems with multiple CPUs, operating systems and networks." *Enquiries, Mike Barlett, tel: (07) 271 2999*

21-23 Australian Optical Disc Conference This conference and trade exhibition, co-hosted by Technisearch and the Australian Communications Association, will be held at the World Congress Centre in Melbourne. *Enquiries, Marisa Chiappi, tel: (03) 660 5172*

Training

July

5 PC Memory Management Seminars Sourceware is conducting a series of seminars which will cover topics such as the difference between extended and expanded memory and how computers use memory. The series begins on this date in Sydney and will move to other states. *Enquiries, Peter Webster, tel: (02) 427 7999*

9-10 Taking Advantage of Version 6 of the SAS System A course for Version 5 users who want to take advantage of the enhanced features in Release 6.06. *Enquiries, SAS Institute, tel: (02) 908 2244*

11-12 WordPerfect Advanced Level I and II Run by Future Technologies, students can take one or

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DIARY DATA

two days to improve their WordPerfect skills. *Enquiries, Cynthia Kuiper, tel: (02) 261 4211*

23-24 Introduction to Applause II A course designed by Ferntree of Melbourne to thoroughly acquaint new users with the sophisticated features of this product. *Enquiries, Gloria Maré, tel: (03) 629 8000*

25 Introduction to CAD Using CADKEY three-dimensional software A course over five sessions conducted on AT desktops using CADKEY drafting software which will concentrate on practical exercises to increase participant's abilities in sequential and logical steps. *Enquiries, Moorabbin College of TAFE, tel: (03) 556 9654*

30-31 SUPERCALC Course Computer Associates is conducting this course on the use of CA-SUPERCALC, a spreadsheet for all platforms. *Enquiries, Cassandra Warren, tel: (02) 923 2066*

Exhibitions

July

10-13 Computers in Education Exhibition A trade exhibition being held in conjunction with the Fifth World Conference on Computers in Education will take place at the Sydney Convention Centre at Darling Harbour. *Enquiries, Julia Jeffrey, tel: (02) 954 0842*

August

8-10 Autodesk Expo This Expo at the World Congress Centre in Melbourne will feature the latest developments in PC-based CAD/CAM including a preview of AutoCAD Release 11 and related third-party products. *Enquiries, Sue Felton, tel: (03) 698 4210*

12-15 PC90, Office Technology 90 and Communications 90 Australia's largest computer show comes to Melbourne at the Royal Exhibition Building. *Enquiries, Australian Exhibition Services, tel: (03) 267 4500*

September

10-14 Ausgraph '90, the eighth annual Australasian conference and exhibition on computer graphics, will be held at the World Congress Centre in Melbourne. The organising committee has called for papers from all areas of computer graphics. Those covering the application of computer graphics are particularly encouraged. *Enquiries, Ausgraph '90 Secretariat, (03) 387 9955*

Compiled by Janice Hogg, tel: (03) 531 8411 or fax: (03) 525 6125

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Kester Cranswick chip chats about industry happenings.

When Compaq held its Technology Forum recently, part of the action was a monolithic display of networked PCs. Naturally, Chip Chat thought they would all be Compaq PCs, though a few Macintoshes would not be amiss. But to the surprise of many (even some of the Compaq staff) there was an IBM PS/2 computer attached to the network. And the explanation for this peculiar arrange-

ment was that it demonstrated the networks' ability to talk to any PC hardware, even IBMs!

A few weeks later, IBM took its Solutions Marketplace extravaganza around the eastern seaboard. Did Big Blue reciprocate and show a Compaq PC attached to its networks? No way. Shame on you, IBM, shame.

Only WordPerfect resellers and users would have appreciated the card they received in the mail last month. On the front was a keyboard with the Ctrl and F4 keys highlighted in baby pink. Inside was notification of a change of address. The link? Ctrl, F4 is the keyboard command for WordPerfect's Move function. Cute. The only problem was that printed on the front of the card was the line 'Ctl, F4'. Aaaargh, fie the poof eader.

Trust an insurance company to find a new sales gimmick. In this particular case, Zurich Australian Insurance jumped into bed with IDG, the publisher of several lesser-known computer magazines, to launch an insurance

scheme for that underpaid and overworked group of people — computer professionals.

Under the grand title of 'The Australian Computer Profession Group Insurance Plan', it has 'like Fortran, been created specifically to meet your needs'. But I already use COBOL, you say. 'Using any other [scheme] makes about as much sense as using sign language to write a program', is the response.

The scheme has lower than normal premiums, and is available only to computer professionals, accountants, doctors or lawyers. In other words, any group with a thing going with Zurich.

As a friendly voice on the other end of the 008 information line said, "it's just a marketing gimmick."

Down the line

Aussie manufacturer, Terran, says that while it makes a full range of PCs there are only two models selling, **the 386SX and the 486**. Most desktops don't need 32-bit peripherals, so why buy the more expensive full-blown 386? Servers require the 32-bit interface, but why buy a 386 when a 486 is faster? As for the 286, there's this **little problem** with 32-bit software compatibility.

Talking of the 286, Intel is so keen to blow this much-cloned CPU out of the water that it's gone into overdrive by **slowing down the 386SX**. The new 12MHz low-power chip is designed to kill the 286 in the laptop market. It will cost a bit more, but what the hell, it runs Windows 3.0 in enhanced mode.

With continuing chip shortages **the race is on to clone the 386**. Front runner is rumoured to be **NexGen**, cashed up with a recent investment from Compaq, which fears competition from Intel's Systems Division. Rumour has it that **Intel is not amused** and has put Compaq at the bottom of its waiting list to punish the company for disloyalty.

Intel is now talking about the **80786**, both to dampen fears of a RISC revolution and to convince clone makers they're so far behind they **might as well just give up**. Planned for the year 2000, the 786 will run at 2000mips at a clock speed of 250MHz. As a colleague put it, "I reckon WordStar will really burn rubber on that chip." Yeah, and all the other 8088 code.

Highlighting the **absolute dedication** with which the big boys are chasing the corporate PC market, Bull now sells Network General's LAN troubleshooter, the Sniffer, through its Integrated Network Solutions group. According to Bull, it's the **best thing since sliced bread**. The company omitted to mention, however, that the Sniffer has been selling here for two years through distributor, Integrated Network Solutions (INS). After some initial confusion a spokesperson confirmed the product had been and would continue to be sold through INS. **Know Bull** as they say in the Antipodes.

Chris Bowes

Readers of National Geographic will be queuing up to buy the latest piece of software from PC Globe Inc, distributed in Australia by Reckon Software. Called PC Globe 3.0, it is an atlas on a disk, with an extensive database of national statistics, currency conversion rates, time zones and a heap of other useful information.

Not so useful to Australian customers, is PC USA, which gives comparative crime rates among other things. But Chip Chat is disappointed that Reckon Software does not import the real showstopper in the PC Globe catalogue, PC Nation. This piece of programming wizardry not only dances, it sings 175 national anthems. Ever heard the tango-based Turkish national anthem? What do Mauritians sing at flag raising ceremonies? If the Cameroons won the world cup, what would the band play? It is all on this disk, for just \$US29.95. Chip Chat

reckons Reckon is turning its back on a program that could be to software what the singing budgie is to opera.

The Victorian president of the Cake Appreciation, Knowledge and Education Society, Michael Hewitt-Gleeson, also has a few ideas on what makes our brain tick. He has invented what he calls 'software' for 'our own personal computer, the Brain PC'. It would give "enough computing power to design solutions for any of the world's problems," he said in an interview with a local paper, the Moorabbin Standard.

One of the software tools has the instantly memorable acronym, CVSTOBVS, standing for Current View of the Situation to the Better View of the Situation. And he believes that the Brain PC can be programmed, through repetition. Sounds like the bloke is Australia's answer to Timothy Leary.

END



It is the thought that counts. When AutoCAD was awarded a prize by PC World, company executives no doubt cracked a bottle of Perrier in their excitement. But when the grand trophy showed up, they were shocked to find that it had more cracks than Steve Vizard. Maybe the next award will be made of rubber

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